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(Assisted by several Scientific Gentlemen.)

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No. CCLIII.

RECENT PATENTS.

To John Flack Winslow, *of the City of Troy, in the State of New York, and United States of America, iron master, for improvements in machinery for blooming iron.* [Sealed 31st March, 1852.]

This invention has reference to a novel mode of performing the process of blooming iron by machinery. Hitherto it has been the practice when operating upon puddlers' balls, either to rid them of the cinder by subjecting them to a hammering operation, or to extract the cinder by submitting the balls to the action of rotating compressing or squeezing surfaces; but, to both these methods, objections have been raised, although each is acknowledged to possess peculiar advantages. Thus the hammering action is believed to produce a superior quality of iron, but at an increased expenditure, as compared with the rotating compressing surfaces; and, on the other hand, while the squeezing process is generally acknowledged to effect a saving in the cost of the operation, machinery working on this principle has been objected to, as being liable to lap up portions of cinder, and knead them into the bloom. Now, the object of the present invention is to combine the advantages of both these plans of working, without the disadvantages which have been supposed to attend them; and, in order to obtain this beneficial result, the patentee avails himself of both the hammering and kneading actions.

In Plate I., two modes of carrying out the invention are exhibited; but, in each instance, the hammer-action is shewn applied to an arrangement of blooming machinery, for which

a patent was granted to Alfred Vincent Newton, October 14th, 1847, upon an application made on behalf of the present patentee. It will, however, be obvious, that the hammer-action may be readily adapted to other kinds of machinery used for blooming iron, wherein the bloom is worked by pressing or squeezing surfaces, having a revolving or an axial motion.

In Plate I., fig. 1, represents a transverse vertical section of an arrangement of machinery for subjecting puddlers' balls, while under the action of a continuous and gradually increasing rolling pressure, to a succession of smart blows, whereby the "upsetting" of the iron and the kneading operation will be simultaneously effected. Fig. 2, is a sectional plan view of the same, taken in the line 1, 2, of fig. 1. This machine consists of a bed-plate A, A, to which massive standards B, B*, are bolted. These standards carry, at their upper ends, bearings for a shaft C, on which an excentric fluted roller D, is mounted. Immediately below this roller D, a pair of fluted rollers E, E*, is mounted in bearings carried by the standards B, B*. Keyed to the axle of each of these rollers is a spur-pinion F; and into the teeth of these pinions gears a pinion G, (indicated by a dotted circle in fig. 1,), which is mounted on the driving-shaft H. Rotary motion is also communicated from this pinion G, to the cam D, by means of a cog-wheel I, (indicated by a dotted circle), which is keyed to the shaft C, and is driven by the pinion in the direction of the arrow, fig. 1. The fluted rollers E, E*, form the bed for sustaining the bloom while undergoing the pressing and hammering action. At the front end of these rollers, and in a line parallel with their axes, a horizontal rod J, is mounted;—this rod slides in suitable bearings L, L*, and carries, at its inner end, a hammer-head J*, of such a sectional form that it will work in the space between the rollers E, E*, above the line of their axes. Upon the rod J, is fixed a shoulder K, fitted with a friction-bowl; and between this shoulder and the bearing L, the rod is surrounded by a helical spring M; the action of which is to drive the hammer-head forward into contact with the bloom of iron upon the rollers. On referring to fig. 2, it will be seen that the axle of the roller E*, is elongated to receive a cam N; and that this cam works in contact with the bowl of the shoulder K; by which means the hammer is carried back after it has acted upon the bloom, and is again impelled forward by the action of the spring M, immediately that the bowl can escape from the inclined face of the cam N. The lateral pressure to which the bloom is subjected by the continuous action of the hammer

is sustained by a plate O, firmly secured to the standard B*. P, is a latch for holding back the hammer-head, until the hammering or upsetting of the bloom is required to be commenced. This latch is withdrawn by the depression of a foot-lever, which is connected thereto by a chain, for the convenience of bringing the lever close to the attendant, who stands near the driving-shaft, in order to have the movement of the machine under his command. Q, is a ledge, intended to receive the bloom when it is brought to the machine.

The iron to be operated upon is fed into the machine while the recess in the periphery of the excentric-roller D, is presented to the bed-rollers. The ball having been laid between the bed-rollers, rotary motion is communicated to the machinery from any first mover;—and the increasing diameter of the roller D, being now brought round, the ball will be subjected to great pressure between the three revolving surfaces; which pressure will increase, by reason of the increasing excentricity of the roller D, and cause the ball to spread into a bloom, and thereby yield up any cinder which it may contain. The hammer is, at the same time, released from the catch which kept it quiescent; and, by the alternate action of the spring M, and the cam N, it will be caused to deliver a series of blows on to the end of the bloom, and thereby ensure the discharge of the cinder therefrom, while it effects a more perfect condensation of the metallic mass. When the pressure of the roller D, is taken off the bloom, by the recess in the periphery of the roller being presented to the bed-rollers, the workman draws the bloom out of contact with the roller E*, on to the roller E, which, by its continued rotation in the direction of the arrow, fig. 1, will discharge the bloom on to the plate Q, whence it may be readily removed.

Fig. 3, exhibits, in side elevation, a modified arrangement for working the hammer,—weighted levers being employed in lieu of the helical spring for giving the forward impulse to the hammer, and steam being employed, in place of the cam, for drawing back the hammer. A, is a rod, which carries, at one end, the hammer-head, and at the other a piston, which works in the steam-cylinder B. This cylinder is furnished with entrance and exit-passages and valve, in the usual manner of steam-cylinders; and the valve is worked either by hand or by the driving power of the machinery. Two weighted levers C, are keyed to the ends of a cross axle D, which is connected, by shackles E, E, to a cross-head F, carried by the rod A. Projecting downwards from this cross-head F, is a forked piece G, which, as the rod A, moves backwards and for-

wards, is brought into contact with one of two stops on a horizontal rod H, in connection with the valve-rod, and thereby opens either the induction or eduction passages of the steam-cylinder, as may be required. When steam is let into the cylinder, the hammer-head will be drawn back, and the weighted levers C, will be raised into the position shewn; but immediately the exhaust port is opened, the weighted levers will fall and impel the hammer-head forward, causing it to upset the bloom in the manner before described. Instead of the weighted levers, a helical spring may be employed in combination with the steam-cylinder, to actuate the hammer, if thought desirable; or the steam may be used alone for actuating the hammer.

The patentee claims the application of a reciprocating hammer to machinery constructed on the principle of blooming iron by the pressure of rolling surfaces, whereby he is enabled simultaneously to subject the bloom to percussion and pressure, for the purpose of more effectually extracting the cinder therefrom, and condensing and consolidating the metallic mass.—[*Inrolled September*, 1852.]

To RICHARD STUART NORRIS, *of Warrington, in the county of Lancaster, civil engineer, for certain improvements in the construction of the permanent way of railways, bridges, locks, and other erections, wholly or in part constructed of metal; also improvements in brakes for railway carriages.* —[Sealed 10th February, 1851.]

THE first part of this invention relates to a method of joining together, fastening, or supporting the bars of railways, various parts of iron bridges, locks, and other erections; and it consists in effecting such object, by casting molten iron, or other suitable metal, upon or about the said rails, or other parts intended to be joined, fastened, or supported. The apparatus used for carrying out this part of the invention may be of any ordinary suitable construction; and the improvement may be extended to a great variety of applications: the patentee, however, describes certain methods which he prefers for effecting the required object, and gives such instances of its application as will serve for examples.

Secondly, the improvements consist in the use of a portable cupola and appendages, for casting portions of railways, bridges, locks, or other erections, at or about the situation where such articles are intended to be used.

In Plate I., figs. 1, 2, 3, 4, and 5, represent, in several views, a construction of metal chill-mould, which is employed for casting iron, or other suitable metal, on to the bars of railways, so as to join two of such bars together, and, at the same time, form a chair for the immediate support thereof. The apparatus is formed in two principal portions, which are shewn separated in end view at figs. 1, and 2, and in top view at figs. 3, and 4, and combined together in the transverse section, fig. 5. To a plate of metal *a*, is bolted a block *b*, which is formed with a cavity constituting one half of the mould, corresponding to the form of chair desired to be produced; and the ends of this cavity are made at their outer edges *d*, to correspond in form to the section of the railway bars intended to be joined. The other half *b**, fig. 2, is similarly formed; and in each half there is a perforation, to receive a pin *e*, which serves as a core for forming a spike-hole in the foot of the chair. The plate *a*, is provided with guide-pieces *f*, *f*, which serve to regulate the position of the half-mould *b**, so as to cause it to be situated opposite to the fixed half *b*, when the two are brought together.

In using this apparatus for joining rails which are in their places on lines of railways, the plate *a*, is to be placed under the rails whereon the metal is to be cast,—the edges *d*, *d*, of the mould *b*, being brought into contact therewith; and the other half-mould is then to be slidden between the guide-pieces *f*, *f*, until its projecting edges *d**, *d**, bear against the rails, and the projecting parts *g*, *g**, of each half-mould are in contact with each other, as seen in the section, fig. 5. A pin *h*, is now passed through a hole in the plate *a*, so as to secure the separate pieces in that position. A cavity will thus be formed, corresponding to the section of the intended chair, and within which the rails to be joined and supported are situated,—acting, in fact, as the core used according to the usual method of casting chairs. Molten iron, or other suitable metal, is now to be poured through the orifice *i*, until the mould is filled; and a chair is thereby formed upon the rails, fitting thereon exactly at every point, as shewn in the side view, fig. 6,—spike-holes, for attachment to the sleepers, being at the same time produced by the core-pins *e*, *e*, which should be removed immediately the metal is sufficiently set, so as to prevent their becoming too tightly fixed by the contraction of the casting. In order to provide for the escape of air during the casting process, an aperture *k*, is formed upon the half *b**, communicating with the interior of the mould.

The above description refers to a "joint-chair;" but it will

be evident that, by merely modifying the shape of the moulds, "middle-chairs," and other constructions, may, in like manner, be cast.

Although it has been stated that chill-moulds are used, yet, if desired, the moulds may be formed of sand, or other suitable material.

Figs. 7, and 8, illustrate the application of this part of the invention to fastening a chair (which has been cast in the ordinary manner) to a railway-bar, by casting iron, or other suitable metal, into the space usually occupied by the tightening-key or wedge. In order to effect this, the wooden or other key or fastening is withdrawn, and pieces of wood, or other suitable material, placed at each ends of the now vacant place, as shewn at *l*, *l*, in the plan view, fig. 7. Sand, or ballast, is beaten up against the pieces *l*, *l*, as represented by the dots; whereby, on the pieces *l*, *l*, being withdrawn, a mould will be formed, into which the molten metal is to be poured; and thus a key will be cast fitting the cavity at every point, and extending over the face of the chair at *m*, *m*, fig. 8, so as to be prevented from leaving its proper situation.

Figs. 9, and 10, exhibit the application of the improvement to the construction of bridges. Fig. 9, is a sectional view of the skew-back, bed-plate, and portion of a girder; and fig. 10, a horizontal section thereof, taken about the line 1, 2, of fig. 9. The girder *a*, is inserted into the mortice *b*, of the bed-plate *c*; and then a thin plate of wrought-iron, or other material, is placed so as to cover the mortice *b*; and molten iron, or other suitable metal, is poured into the cavity thus formed: by which means, the girder and bed-plate will be firmly united.

A mode of applying the improvement to the construction of locks is shewn at fig. 11, which is a top view of the foot-box of a lock. The foot-step *a*, having been adjusted in its proper position within the box *b*, molten iron, or other suitable metal, is poured into the surrounding space *c*; and thus a perfect union of the two is effected. In a manner similar to this, the ends of girders may be keyed in or fastened together, and various other portions of metallic erections joined or supported. In cases where it is necessary to provide for an expansion and contraction of the parts to which the improvement is applied, the patentee adopts the following or other method of interposing a stratum between the new casting and those parts intended to be joined or supported:— Upon coarse canvas, or other suitable fabric, a coating of loam and lime, or any such substance, is spread; and a piece of such prepared material is placed in contact with the rails,

or other parts, so as to cover the entire surface intended to be cast upon.

Thus far the patentee has explained how his improvements may be carried into effect by the use of any ordinary apparatus. He now proceeds to describe a portable cupola, for melting the metal to be cast upon the spot where it is desired to be used, and which constitutes the second part of his invention. This apparatus is shewn in side elevation at fig. 12. The barrel of the cupola, shewn at *a*, is composed of sheet-metal, and lined with fire-bricks or fire-clay; it is provided with a door of the usual construction at *b*, and a spout at *c*; on either side are handles *d*, *d*, for the convenience of lifting when it is required to be removed from the framework; and to the upper part are attached two standards *e*, upon which the ladles may be placed, in order to keep them in a heated state. The cupola, thus formed, is attached, by means of bolts, to a framing *f*, upon which is also affixed the casing *g*, of a rotatory-fan *h*. To the fan-casing *g*, two plates *i*, are rivetted, and are connected at their forward ends, by means of bolts, to angle-pieces, attached to the sides of the cupola; and the casing *g*, is also furnished with a conical pipe, that projects forward between the plates *i*, and enters an orifice formed in the barrel of the cupola. Upon the axis of the rotatory-fan *h*, there is a small pulley *k*, connected, by means of a band, to a larger pulley *l*; upon the axis whereof there is a pinion *m*, taking into the teeth of a wheel *n*; which wheel *n*, is capable of being put in motion by means of the winch-handles *o*, *o*; and therefore, by turning such handles, the fan *h*, will be caused to rotate and drive a blast of air into the cupola *a*, so as to effect a speedy melting of the metal. This apparatus may readily be conveyed from place to place, where the improved method of applying cast metal, as before described, is required to be used; or it may be applied to the purpose of casting ordinary railway-chairs, or other parts of railways, portions of bridges, locks, or other erections, upon or about the spot where such articles are required to be used.

The patentee claims, Firstly,—joining, fixing, or supporting the bars or other metallic portions of railways, bridges, locks, and other metallic erections, by pouring molten iron, or other suitable metal, on to or about such parts. Secondly,—the employment of a portable cupola, for the purpose of casting portions of railways, bridges, locks, or other erections, at or about the situation where such castings are intended to be used.—[*Inrolled August*, 1851.]

To William Beckett Johnson, *of Manchester, in the county of Lancaster, manager for Messrs. Ormerod and Son, engineers and iron-founders, for certain improvements in railways, and in apparatus for generating steam.*—[Sealed 9th February, 1852.]

These improvements relate, first, to certain modes of constructing turntable tops of wrought-iron; and, secondly, to certain arrangements of steam-boilers, and also to a method of fitting tubes to the tube-plates of boilers.

In Plate II., fig. 1, is a plan of the improved turntable, with the planking removed, for the purpose of shewing its construction; and fig. 2, is a transverse section through the centre of the turntable. *a*, is the outside curb, which may be of the ordinary description; and *b*, *b*, are the rollers, supporting the rim of the turntable: which rollers may either be fixed or moveable, as desired. The framework of the turntable top is constructed of bars of wrought-iron, bent or made in the form shewn at fig. 3; four or more of which are firmly bolted or rivetted together,—the ends *c*, *c*, nearly meeting in the centre. The roller path of the turntable top, is formed by bolting, rivetting, or contracting upon the outside of these bent bars, when put together, segments or complete circles of angle iron, as shewn at *d*. The centre *e*, may be made either of wrought or cast-iron, firmly bolted, rivetted, or contracted upon the ends *c*, of the framework. The elevating or centre pin *f*, may be fixed to the centre by any of the usual methods. The rails *g*, upon which the carriage is received and supported whilst turning, are placed on the top of this framework and secured to it by chairs or fixings; and the spaces between and outside the rails are fitted up with the ordinary planking, secured to the framework by bolts.

Fig. 4, is a transverse vertical section, and fig. 5, a horizontal section of a stationary tubular boiler, constructed according to the second part of this invention. *a*, is the outside shell of the boiler, made of a circular or cylindrical shape; and *b*, *b*, are the furnaces, which are also made of a circular or cylindrical form. The front ends *c*, *d*, of the furnaces are placed at each end of the boiler; and the products of combustion passing over the bridges *e*, *e*, meet each other in the chamber *f*, and pass thence through the tubes *g*, *g*, into the down flues *h*, *h*, communicating with the chimney.

Fig. 6, is a transverse vertical section, and fig. 7, a horizontal section of another stationary tubular boiler, on the improved plan. The outside shell of the boiler and the furnaces

are of a cylindrical or circular form, as in the boiler before described. The front ends *c, c,* of the furnaces are placed at one end of the boiler. The products of combustion passing over the bridges *d, d,* enter the chamber *e,* in opposite directions, and pass thence through the tubes *f, f,* into the down flue *g,* communicating with the chimney.

Fig. 8, is a longitudinal vertical section of a steam-boiler, shewing the application of this part of the invention to a stationary boiler, having external flues formed of brick or any other suitable material. The shell of the boiler and the furnaces are likewise cylindrical or circular in this instance. The front ends *c,* and *d,* of the furnaces are placed one at each end of the boiler; and the products of combustion passing over the bridges *e, e,* meet each other in the chamber *f,* and, passing thence through the opening *g,* are conveyed round the boiler by external flues leading to the chimney. If desired, two or more pairs of furnaces, arranged as just described, may be placed in the boiler,—the external flues being so arranged that the products of combustion may be conveyed round the external surface of the boiler-shell, at a proper distance below the surface of the water contained in the boiler. The arrangements of apparatus described, are particularly adapted to effect the more perfect combustion of the smoke and gases arising from the furnaces; for it will be observed, that streams, separately generated, are caused to meet each other from opposite directions, by which a mingling of their elements is effected; and, in order that the object may be most perfectly attained, the furnaces should be supplied alternately with fuel.

The last improvement in apparatus for generating steam is shewn at figs. 9, and 10. Fig 9, represents a section of part of a tube-plate previous to the tube being fitted to it; and fig. 10, exhibits a section of part of the tube-plate with one of the ends of a tube attached. The holes in the tube-plate are first drilled or cut out in the ordinary manner, so that the tubes will drive moderately tight into them; and then, at about the centre of the thickness of the tube-plate *a,* circular cavities or spaces *b,* are cut or formed in the tube-holes,—such central cavities being thus made of larger diameter than the tube-holes, as ordinarily required. The tube *c,* is now placed in its proper position in the tube-plate; then an expanding mandril having a circular projection, bendor flange formed upon it, corresponding in general shape with the cavity *b,* is driven into it, so as to cause the tube to expand and fill the cavity *b*; after which, the end *d,* of the tube is rivetted against the circumference of the tube-hole by any of the ordinary

methods. When ferrules are used, three or more segments are fitted in the circular cavity formed by the mandril in the tube; and then an ordinary taper ferrule is driven into the tube, bearing rather more upon the segments than upon the tube. By this mode of fitting tubes to tube-plates, they are prevented from becoming loose either by expansion or contraction,—both ends of the tube being secured to the tube-plates in the manner described. In figs. 9, and 10, there is shewn a peculiar form of cavity into which the end of the tube is forced; but it will be evident that others may be adopted if desired.

The patentee claims, First,—constructing the framework of turntable tops of wrought-iron bars, bent or made in the form of sectors of a circle, bolted, rivetted, or otherwise connected together. Secondly,—the application of two or more furnaces or chambers, applied to a boiler in such a manner that the products of combustion proceeding therefrom meet each other from opposite directions. Thirdly,—the application of tubes to stationary boilers in such manner that the products of combustion shall return through them to the front or fixing end of the boiler,—as illustrated by reference to figs. 6, and 7. Fourthly,—fitting tubes to the tube-platesof boilers, by causing their ends to be expanded or forced into the cavities or enlarged diameters formed in the ordinary tube-holes of the tube-plates. —[*Inrolled August*, 1852.]

To JONATHAN WRAGG, *of Wednesbury, in the county of Stafford, coach and axletree smith, for certain improvements in railway and other carriages.*—[Sealed 26th April, 1851.]

THIS invention consists, first, in so constructing railway carriages and trucks that the brakes may be brought into action, for the purpose of retarding them, when the buffers are pressed back; and, secondly, in an improved method of manufacturing axles for railway and other carriages.

Plate I., contains a side elevation, partly in section, of the lower part of a railway carriage or truck, constructed according to the first part of this invention. *a*, is the buffer-rod, fitted with a piston *b*, which slides in the cylinder *c*, containing a helical spring *d*; and the rod *a*, extends through the spring, and slides in a bearing at the end of the cylinder. *e*, is a lever, mounted on an axis *f*, and carrying at its lower end a skid or brake *g*, to act on the surface of the rail; or, instead of such skid or brake *g*, a brake, suitable for acting on the

periphery of the carriage-wheel, may be affixed to the upper part of the lever, as indicated by the dotted lines at *h*. *i*, is a spring, which presses against the lever *e*, in order to keep the brake off the rail or away from the wheel, when the buffer is not pressed back. If all the carriages in a train are fitted with this arrangement for applying the brakes, it will be evident that, in the event of the locomotive engine being checked or stopped, the buffers will be forced back, and the projections *j*, upon their rods, will press against the levers *e*, and apply the brakes. Each carriage will thus be retarded by its own brakes; and the momentum of several carriages behind will be prevented from causing an injurious pressure upon the more forward carriages, from the circumstance that each carriage will have to overcome the retarding action of its own brake before it can press on the carriage in front of it. By means of this arrangement, the engineer will have greater control over a train than heretofore; for he will only have to retard the locomotive engine, and the momentum of each carriage will cause it to press forward, and thereby bring its brakes into action.

The improved method of manufacturing axles for railway and other carriages is as follows:—In the manufacture of axles, it has been usual to employ wrought-iron or steel, or the two metals combined, forged into the desired shape; but the patentee proposes to make the axles by casting in metal capable of being rendered malleable by annealing; and the metal which he prefers to use for this purpose is such as is made under a patent granted to William Onions, of Southwark, for improvements in the manufacture of steel. Moulds are prepared suitable for producing the forms of axle required; and in casting such axles cores are placed in the moulds, so that the axles will be cast hollow. The castings are annealed in the manner heretofore practised in annealing articles of malleable cast-iron.

The patentee claims, First,—the mode, above described, of causing brakes to be brought into action when the buffers of railway carriages, railway trucks, and other railway carriages are pressed back. Secondly,—making the axles of railway and other carriages by casting them in metal and annealing the same, as above described.—[*Inrolled October*, 1851.]

To John Holmes, *of Birmingham, in the county of Warwick, machinist, for improvements in machinery for cutting and stamping metals.*—[Sealed 24th June, 1851.]

This invention relates, in the first place, to an improved arrangement of machinery for cutting out of a plain sheet or strip of metal, blanks of any suitable form required for buttons, eyelets, rings, nails, steel pens, and other similar articles; and, secondly, to an improved mode of constructing fly-presses, for the purpose of forming and finishing or completing the articles before mentioned, or other similar articles, by means of stamping or pressing. The improved machinery for cutting out blanks for any of the before mentioned purposes, is shewn in Plate I. Fig. 1, represents a front elevation of the machine; fig. 2, is a longitudinal vertical section thereof, shewing the principal internal working parts; and fig. 3, is a side elevation, shewing the means of actuating the feeding apparatus. A long strip or sheet of metal *a*, from which the blanks are to be cut, is wound or placed upon a roller *b*, and is thence conducted into the machine over a breast-roller *c*. In passing through the machine, the strip of metal *a*, comes under the steel punches *d*, *d*, hereafter more particularly described,—and between the jaws *e*, *e*, of the feeding apparatus; and the waste metal is wound or coiled on, or delivered over another roller *f*, on the other side of the machine. The steel punches, which may be of any suitable shape, according to the description of article intended to be produced, are secured in a plate *g*, by means of set screws *h*; and this plate *g*, is attached, by means of screws, to another plate *i*, connected by a dovetail to the plunger *j*; from which, however, it may be detached by removing the bolt *k*. The plunger *j*, is moved up and down, in stationary guides *l*, *l*, by means of the rods *m*, *m*, which are actuated by the excentrics *n*, *n*, at each side of the machine. The lower ends of the punches *d*, *d*, work through holes in a plate *o*, (called the "puller-off" plate) under which the strip or sheet of metal *a*, passes; and the punches are also caused to enter holes made in the punch-plate *p*, which is dovetailed into a cast-iron bed *q*. It will therefore be seen that at every descent of the punches *d*, *d*, they will force out of the strip of metal *a*, blanks or pieces of corresponding size and shape, which will pass down through the punch-plate *p*, and bed-plate *q*, and descend the incline *t*, into any suitable receptacle below. It will also be evident that when the punches rise again, the plate *o*, will hold down the strip of metal *a*, while the punches return to their normal

position, ready to make another descent; and by that means it will pull the metal off the punches.

In order to bring a fresh portion of the strip or sheet of metal *a*, under the punches, at every fresh operation, the feeding apparatus *e*, *e**, is made to take hold of the strip of metal and move forward immediately that the strip is relieved from the punches. This operation is effected in the following manner:—The feeding apparatus consists of two jaws *e*, and *e**;—the former is secured to the upper ends of the rods *u*, *u*, and is capable of rising and falling; while the lower one *e**, is stationary. The rods *u*, *u*, are attached, at their lower ends, to a horizontal bar *v*, which is furnished with a coiled spring *w*, that has a tendency to raise the upper jaw, *e*, and consequently open the jaws of the feeding apparatus,—except when they are kept forcibly closed by the levers *x*, as will be hereafter described. A vibrating or reciprocating motion is communicated to the feeding apparatus for the purpose of drawing forward a fresh portion of the strip of metal *a*, for every descent of the plungers. This motion is effected by means of adjustable cam-pieces *y*, bolted to the arms *m*, and made to act against bowls or anti-friction rollers 2, connected to the vibrating frame of the feeding apparatus, which is mounted on a centre or pivot 1, below, as seen in the sectional view, fig. 2. It will now be understood that, as the main shaft of the machine rotates and actuates the excentrics *n*, and arms *m*, the vibrating motion of the latter will bring the cam-pieces *y*, against the bowl 2, of the vibrating frame of the feeding apparatus, and will force the same back; and as the jaws at that moment have tight hold of the sheet or strip of metal *a*, the latter will be drawn forward the required distance every time the cam-pieces *y*, strike against the bowls 2. The strip of metal *a*, having been drawn forward the proper distance, it is held fast by the jaws of the feeding apparatus until the punches *d*, *d*, descend; but when the punches are descending and operating on the metal, the jaws *e*, *e**, are opened by the smaller diameter of the cams *z*, (see fig. 2,) coming round and allowing the levers *x*, to rise, and the bar *v*, to be drawn up by the force of the spring *w*;—at the same time, the cam-pieces *y*, are drawn back from the bowls 2, by the continued rotation of the cam *n*; and the vibrating frame of the feeding apparatus being forced back by the spring 3, is then ready to take another grip of the metal *a*, which it will do immediately the larger diameter of the cams *z*, is brought round and made to act on and depress the levers *x*. The cams *n*, and *z*, are all mounted on the main shaft; and the several operations, above described, are timed in such a manner that the strip of

metal *a*, is never left free, but is either held by the jaws *e*, *e**, or else is under the operation of the punches. According to the size of the articles to be produced, or the blanks to be cut, so must the length of the feed be; and this is roughly adjusted by means of the adjustable cam-pieces *y*: but when the size of the articles does not differ very materially, the feed may be most accurately regulated by means of the adjusting and regulating screws 4, 4, the ends of which project through the lower jaw *e**, and, by coming against the side of the stationary standards of the machine, prevent the spring 3, from forcing back the feeding-frame too far. In the detached view, fig. 4, there is exhibited another mode of actuating the feeding apparatus, which is applicable where the plan shewn in fig. 2, will not give sufficient feed: it will also be found peculiarly useful when the punches have become shortened by wear; as by adjusting the several parts, the operator is enabled to compensate for this wear. It has been already stated that it is necessary to hold the strip of metal firmly all the while it is in the machine; and that when the feeding apparatus has left go, in order to come forward and take hold of a fresh part, the punches are in operation, and the metal cannot shift its position; but when the punches have become shortened by wear, they will, on rising, quit the metal too soon, and will not return again in time to lay hold of it until the jaws of the feeding apparatus have quitted their hold;—the metal will therefore be left free in the machine, and may shift its position and spoil the work. To prevent this, and compensate for the wear of the punches, it is found advisable to employ the arrangement for working the feed, shewn in the detached view, fig. 4. This arrangement, which is attached to the jaw *e**, of the feeding apparatus, consists of a slotted cam-piece 5, secured by screws to a slotted arm 6; so that, by the peculiar form or inclination of the end of the cam-piece 5, the latter (which is forced inward with the jaw *e**, by the spring 3, against the cam-piece *y*), may remain stationary, until the punches again descend and begin to operate upon the metal.

Fig. 5, is a longitudinal vertical section of a fly-press, constructed according to the second part of this invention; and fig. 6, is another vertical section, taken at right angles to fig. 5. The improved fly-press shewn in these figures, is intended to make metal buttons; but it will be easily understood that it can be equally well adapted to produce such articles as eyelets, embossed discs, rings, or other similar articles. The framework or standards *a*, *a*, of the press, as well as the screw *b*, and fly-lever or arm *c*, are similar to those ordinarily employed

for such purposes. The plunger *d*, is attached, in any convenient manner, to the lower end of the large screw *b*, and works up and down in V-guides *e, e*. The plunger is made hollow and is furnished at its lower end with a block *j*, which is also hollow, and carries a compound die or punch *f*, of peculiar construction, hereafter more particularly described. The metal blank to be operated upon, is placed in a stationary die *g*, which is shewn detached in section and plan view at figs. 10, and is fixed in a hollow bed-piece *h*, firmly secured to the foundation of the machine. The compound die or punch *f*, is shewn detached, and upon an enlarged scale, at figs. 7, 8, and 9. Fig. 7, represents a vertical section of the compound die or punch. It consists of two principal parts;—viz. 1st, the punch *f*, (shewn detached at fig. 8,) which forms the holes and centre part of the button, and is a fixture, or remains stationary in the block *j*, of the plunger; and, 2nd,—the moveable die or punch *i*, which surrounds the centre punch *f*, and is capable of moving up and down in its socket in the block *j*, of the plunger. This punch *i*, forms the rim of the button, and is shewn detached in section and plan view, at figs. 9; and the block *j*, to which it is adapted, is screwed at its upper end, so that it may be attached with facility to the lower end of the plunger. The punch *i*, is suspended in its socket in the block *j*, by means of two rods *k, k*, the lower ends whereof are made to fit into dovetailed grooves at the upper part of the punch; and the upper ends of these rods carry a cross bar *o*, against the under side of which, a coiled spring *l*, bears, so as always to keep the die in its socket, except when it is pushed out by the spring being forcibly compressed. The punch *f*, is a fixture in the block *j*, and is secured therein by means of screws;—it is furnished at its lower end with four or any other number of projecting pins *n, n*, which form the thread-holes in the blank. It will of course be understood that corresponding holes are made in the stationary lower die, as shewn, in plan view and section, at fig. 10.

The operation of the above-described parts is as follows:—A blank is placed upon the stationary lower die *g*, and the punches *f*, and *i*, of the plunger are brought forcibly down thereon, by means of the fly-lever or arm *c*,—thereby forming the button complete with the thread-holes, at one and the same operation. The plunger, with its block and punches, will then rise again and carry with it the newly-formed button, which is forced or knocked off the pins *n, n*, by the cross-head or bar *o*, of the inner punch *i*, coming against a stationary stop-piece *p*, figs. 5, and 6, that forces the die or punch *i*, out of

its socket, and thereby pushes the newly-formed button off the pins of the punch *f*, and delivers it into any suitable receptacle. The stop-piece *p*, is fitted into an adjustable plate *q*, which is secured by means of screws *r*, *r*, to the stationary glands *s*, *s*, but admits of being adjusted thereon, so as to fix the stop-piece at any required altitude. Although the punch *f*, is, practically speaking, a fixture in the block *j*, being secured therein by means of the screws, as above explained, yet it is capable of being adjusted, as the face of the punch *i*, wears away. This adjustment is effected by means of the back screw *t*, fig. 7, which, as the face of the punch *i*, wears away, must be from time to time unscrewed, in order to allow the punch *f*, to be drawn back in its socket.

In manufacturing buttons of a superior kind, from a harder material than brass, the patentee sometimes finds it desirable to submit them to a second stamping operation, in order to give them a better finish. When such is the case, he first places the blank in a machine similar to that just described, and thereby forms a rough button, which is planished and finished in a second pair of dies by a subsequent operation. Of course, the button having been roughly formed, and the thread-holes made therein, the compound die or punch, just described, will not be required for the second operation;—a simple die or punch, with a hole through the centre, is therefore all that is required; and in place of the stationary die *g*, another stationary die, with a central hole, is employed, as shewn in the detached sectional view, fig. 11. A rod *u*, attached at its lower end, by means of an arm, to the lever *v*, works in the central hole of the lower die; and, after every stroke of the upper die, this rod *u*, rises and lifts the button out of the lower die. This motion is effected by causing an inclined piece *w*, fig. 5, attached to one arm of the fly-lever, to come against the upper end of the rod *x*, (figs. 5, and 11,) which passes down a hole in one of the standards, and is connected at the other end to the lever *v*. In order to prevent the upper end of the rod *x*, from getting bent, it is found, convenient, in practice, to adapt to the upper end thereof a small lever with a bevilled piece at the extremity, or the end turned back, as shewn in the detached view, fig. 12.

As it will sometimes be found that the button will adhere to the upper die instead of the lower one, the patentee also adapts thereto a clearing-pin (*u**, fig. 13,) which passes through the centre of the die; and at every rise of the plunger the upper end of this pin comes against the stop-piece *p*, whereby its lower end is made to protrude and push off the

button, if it should happen to adhere to the upper die. Or if preferred, the clearing-pin *u**, may have an eye made in, or attached to, its upper part, as shewn, and be, by means of this eye, suspended from the stop-piece *p*; so that, as the die or punch rises, the lower end of the clearing-pin, being stationary, may protrude through the centre of the die or punch, and push off the work if it should adhere thereto. In fig. 5, another mode of working the upper clearing-pin is shewn. In this case, the stop-piece *p*, and adjustable plate *q*, are dispensed with, and the clearing-pin is connected to a rod *p**, which passes up a hole made in the centre of the screw *b*. This rod *p**, is screwed at its upper end to receive a nut, by means whereof it is suspended from the support *q*,* which, being secured to the stationary part of the framework or standards, of course holds the clearing-pin stationary while the punches rise and fall. Fig. 14, is a vertical section of a die for forming rings or washers. This die is constructed upon precisely the same principle as that shewn at fig. 7; there being in both figures a fixed central punch *f*, and a moveable annular punch *i*, round the same, for the purpose of pushing off or delivering the work from the fixed central die or punch *f*;—it will not therefore be necessary to give any more detailed description of this figure.

The patentee does not confine himself rigidly to the precise arrangement of parts above described. He claims, as regards the first part of his invention,—the general arrangement of the several parts shewn at figs. 1, 2, 3, and 4, or any mere modification thereof, for cutting out blanks, of any suitable size and shape, from a plain sheet of metal, which is passed through the machine by mechanical means; and, particularly, the construction, operation, and mode of actuating the feeding apparatus, whereby the strip or sheet, from which the blanks are to be cut, is drawn into and passed through the machine.

In reference to the second part of the invention (viz.,—improvements in fly-presses for stamping metals), he claims, First,—the employment of a hollow plunger and its block, and also the use of a compound die or punch, such as is described and shewn in the drawings, or any modification thereof, consisting principally of the parts *f*, and *i*, one of which is stationary in the block of the plunger, while the other is capable of motion, in order to enable it to push off the work from the stationary part. He further claims the use of the stationary stop-piece *p*, whereby the moveable punch, in one arrangement, and the upper clearing-pin, in another arrangement, is worked; also the means shewn of adjusting the same;

and, further, the modification, shewn in fig. 5, of applying and working a clearing-pin for the upper punches or dies; as well as the means of working the lower clearing-pin, as described and shewn in the several figures. [*Inrolled December*, 1851.]

To JOSEPH DENTON, *late of Rochdale, in the county of Lancaster, and now residing at Prestwick, in the same county, Gent., for improvements in machinery or apparatus for manufacturing looped, terry, or other similar fabrics.*—[Sealed 23rd February, 1852.]

THIS invention consists of improved means of raising the pile, terry, or loop, on the surface of carpets, velvets, or other similar fabrics; which pile, terry, or loop, has been hitherto usually raised from the warp-threads by means of wires or pins, passing through or supporting a portion of the terry-warp sufficient to form the loop, and being withdrawn as the process of weaving progresses; or the said pile, terry, or loop, is sometimes formed or raised by the weft-threads not being closely beaten up by the reed at every pick or shoot, but by a number of them being beaten up at once by an increased action of the reed,—the terry-warp being slackened, to enable it to be puckered up into loops; or the same object is effected by other complicated machinery or processes.

The patentee states that his improved arrangements are both simple in process and economical in construction; and they may be applied to any of the ordinary looms, even to the common loom used for weaving calicoes. To the loom frame, opposite to, and parallel with, the breast-beam and slay or lathe, is attached a small table, on which the warp-threads rest during the operation of weaving. This table has a forward and backward motion, the same as the slay or lathe; but instead of moving at every pick, it only moves when it is necessary to raise the terry. Over this table there is a moveable bar, with a fine or feather-edge parallel with the edge of the table; and this bar is to move vertically, as well as backward and forward, in unison with the table. These motions are obtained and regulated by levers, actuated by a cam on the tappet-shaft; so that, as the slay or lathe is brought forward to beat up the weft-thread in the shed, the said bar advances with the table; then, by its vertical motion, it presses down the terry-warp on the draw-thread and binder on the edge of the table; and, by a well regulated crimping or pinching action, the bar takes up just as much of the terry-

warp as is necessary to form the loop, and keeps it in that position until the requisite number of picks are put in to complete the terry, with which it recedes to the shed, and allows the slay or lathe to beat it up firmly in its place. The bar then rises from the table; after which, the bar and table, and the slay or lathe, retire to their respective positions in opposite directions; and they meet each other again, to perform the same operations, as often as the shuttle places the necessary number of picks in the shed. An extra warp-thread is also introduced under the terry-warp, in order to present an increased substance at the time of raising the terry, and to assist in binding the pick with the back or ground-work.

In Plate II., fig. 1, represents a side elevation of the loom, with the improved apparatus attached; and fig. 2, is a side elevation of the improved apparatus on an enlarged scale. *a*, indicates the frame of the loom; *b*, the tappet-shaft; *c*, the healds; *d*, the roller-beam; *e*, the cloth-beam; *f*, the heddles; *g*, the reed; *h*, the table; *i*, a stay, to regulate the necessary position of the table, by which the required length of the loop is governed; *k*, the warps or warp-threads, resting on the table; *l*, the bar, which descends, and, falling upon the warps at the edge of the table, gathers up as much of the terry-warp as is necessary to form the loop,—then recedes, and allows the slay or lathe to beat it firmly up in the shed. The edge of the bar and surface of the table must be planed and set truly. The bar may be made of one piece of metal, the exact size, having its edge planed truly, to work or scrape on the planed surface of the table, so as to crimp or pinch up the whole of the threads of the terry-warp; or it may be left a little smaller than is requisite for the purpose, and a loose piece or strip of metal, truly planed, may be screwed or fixed on the bar, and removed to be repaired when necessary. *m*, *m*, are levers, giving motion to the table and bar; *n*, is a cam, fixed on the tappet-shaft *b*, which communicates the necessary motion to the levers *m*; *p*, levers, to raise the rods *q*, and bar *l*; *r*, a bell-crank lever, adjusted by the screws *s*, to allow the required forward movement; *t*, a shaft, to which are fixed the rods which support the table *h*; and *u*, a tappet, which acts upon a lever *v*, to ease and regulate the weight on the terry-warp.

The patentee claims those parts of the machinery or apparatus, hereinbefore described, for the better and more effectually raising the pile, loop, or terry, in or on certain fabrics, by the "crimping or pinching-action," produced by the table, bar, and levers, in combination with the apparatus described. —[*Inrolled August*, 1852.]

To GEORGE WRIGHT, *of Sheffield, and also of Rotherham, in the county of York, artist, for improvements in stoves, grates, or fire-places.*—[Sealed 8th March, 1852.]

THIS invention relates to a novel construction of stove-grates and stoves, whereby the heat from the burning fuel may be greatly intensified and conducted into the apartment, and, by radiating from a metallic plate or metallic surfaces, made to warm the air in the room. The novel arrangement consists principally in making or casting, in one piece, the front bars of the grate with a metallic plate or plates or surfaces, which extend therefrom into the room. The patentee prefers to make or construct the front bars in such a manner that they shall overhang and partially cover the fire, which, consequently, lies under and in contact with them; and the heat which they receive from the fire will be conducted from the bars to the metallic plate or surfaces to which the front bars are connected; and from the metallic plate or surfaces the heat will be diffused in the room by radiation. The ash-pan is placed below, and may be taken out through an opening in the radiating metallic plate or surfaces, when it is desired to remove the ashes; and after the ash-pan has been emptied and replaced, this opening is covered up by a light casting, which can be moved with facility,—thereby obviating the necessity of removing bodily the heavy casting of which the radiating metallic plate or plates or surfaces in front of the grate, is composed.

In applying the present improvements to stoves, an overhanging hood or case is employed, which, by holding back the combustible gases and preventing them from passing off unconsumed, greatly increases the heat of the fire. The aperture for the exit of the smoke into the flue is furnished with a damper or regulator for regulating the draft.

In Plate II., fig. 1, is a transverse vertical section, and fig. 2, a plan view of a stove-grate, constructed according to this invention. *a*, is the fire-place; *b*, the grate or fire-bars; and *c*, the ash-pan. *d*, are the front bars, which are curved backwards and inwards, and are thereby made to overhang the fuel; and from the lower ends of these front bars extends the metallic plate or plates or surfaces *e*. It will be seen that the metallic plate or plates or surfaces *e*, form one piece or casting with the front bars *d*; and therefore no impediment exists to the regular transmission or conduction of the heat from the front bars (which are in contact with the fuel) to the metallic plate or plates or surfaces, extending therefrom

into the room. A similar effect may be produced if the front bars, instead of forming one casting, as shewn, are made separate, and prolonged into the room. The back of the fire-place is formed of one or more pieces of fire-brick, as at *f*; and the smoke and unconsumed gases pass through the register *g*, which acts as a damper or regulator of the draft. For the purpose of removing the ash-pan when required, a portion of the front part of the metallic plate or surface *e*, is made moveable, as at *h*. Although this part is represented plain or without ornament, it will be evident that it may, if required, be of an ornamental form, so as to hide the joints made by the moveable piece *h*. Fig. 3, represents the under side of a portion of the end of the metallic plate or surface *e*. It will be seen that the end ornament *i*, is connected to the metallic plate *e*, by means of a pin or screw, which may be slidden along a groove *j*, in the plate *e*; and thereby the ornament *i*, may be moved in or out, as may be required, to suit mantel-pieces of different sizes and forms.

Fig. 4, is a vertical section of a stove, constructed according to this invention. Although the stove differs somewhat in form from the stove-grate just described, yet it is constructed upon the same principle,—the same letters of reference are therefore used to denote corresponding parts. Instead of the fire-bars *b*, in the former instance, the fuel is placed on a lump or piece of fire-brick *b**. The fire-brick, which forms the back of the stove, is curved, and somewhat overhangs the fuel,—thereby increasing its intensity, and also throwing a portion of the heat into the room. The overhanging hood or case *k*, will hold back the combustible gases, and, by preventing them from passing off unconsumed, will greatly increase the heat of the fire.

The patentee prefers that the fire-brick, at the back and bottom of the grate, should be loose, and consist of a separate piece or pieces, which, being unattached to the body of the stove, may be shifted at pleasure, when required to clear away any accumulation of soot, and may be renewed when damaged or worn. The bottom grate is also made capable of being shifted. Thus the whole of the interior arrangements, in connexion with the fire, are separate, and can be removed and replaced, when requisite, without having to pull out and unset the entire body of the stove, and those parts which, from not being subjected to the direct and more powerful action of the fire, are consequently more durable.

The patentee remarks, in conclusion, that he does not mean to confine himself rigidly to the precise arrangement of parts

shewn and described; as they may doubtless be varied without departing from the nature and object of the invention: for instance, the front bars might be made straight and vertical, instead of curved, as shewn; and the projecting metallic plate or surface might be mounted on pivots or hinges, so that it might be lifted up in front when the ash-pan is required to be removed. He further says, he is aware that metallic plates or surfaces, connected to and extending from the fire or grate-bars, on which the fuel lies, have heretofore been used for conducting heat into the room. What he claims is, the arrangement or construction of stove-grates, stoves, or fire-places, shewn and described, or any mere modification thereof, in which the front bars and a projecting metallic plate or plates or surfaces are cast together, so that the front bars, being in contact with the ignited fuel, may receive heat therefrom, and conduct it down the metallic plate or plates or surfaces, which extend or project into the room, in which it is given off from the metallic plates or surfaces by radiation, and becomes diffused in the room. Also the employment of the moveable end ornaments *i*, *i*, and their adaptation to the ends of the metallic plates *e*, so as to cause the same to fit mantel-pieces or fire-places, of various sizes and styles. Likewise the means, above set forth, whereby the ash-pan may be removed, when required, without the necessity of bodily removing the whole of the projecting metallic plate or plates or surfaces.—[*Inrolled September*, 1852.]

To Louis Victor Ruzé, *manufacturer, of Gaillon, in the Republic of France, for certain improvements in the manufacture of hat-plush and other similar silk cloths.*—[Sealed 22nd May, 1852.]

This invention consists in causing hat-plush and similar silk fabrics to pass through a machine containing a horizontal rotating cylinder, the periphery whereof is furnished with teazles or cards which lay the fibres evenly,—the fabrics being prepared and acted on as hereafter described.

The machine consists of the above-named rotating teazle or card-cylinder; of a steam-box above, over which the fabric passes after being teazed or carded; of a rotating brush beneath, that frees the teazles or cards from any adhering fibres; and of several rollers, which conduct the fabric through the machine, and cause it to assume suitable positions for being acted on by the teazles or cards and by the steam-box. One

end of the plush fabric to be operated on is first passed through the machine; and then the ends of the fabric are sewn or fastened together, so as to form an endless band,—the principal portion of which is deposited in a curved holder beneath the machine. The fabric ascends from the holder, and, after passing over and under three small rollers, proceeds over the rotating cylinder, sufficiently close to be acted on by the teazles or cards; thence it is conducted over the steam-box, supplied with high-pressure steam, which passes through holes in the top of the box into contact with the fabric; and from the steam-box the fabric proceeds over and under three other rollers, and returns to the holder.

The plush or similar silk fabric, previous to being operated upon as above described, is subjected (for about a quarter of an hour) to an acid bath, composed of five hundred parts, by weight, of water to one part of sulphuric acid, "heated up to a mild temperature." After the fabric has been taken out of the bath, it is deprived of moisture by a hydro-extractor or other means. In place of sulphuric acid, other acids may be used.

In conclusion, the patentee says, "I do not confine myself to the details herein given; as the same may be varied, so long as plush or such like silk fabrics are subjected to the treatment herein described; and the steam-box, with holes, and the machinery for giving motion to the fabric, and to the cylinder carrying the cards or teazles, may be varied without departing from my invention."—[*Inrolled November*, 1852.]

To ALFRED VINCENT NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of lenses,—being a communication.*—[Sealed 17th April, 1852.]

THE patentee commences his specification with the following explanatory remarks:—"The dioptric lens, heretofore and at the present time in use for sea-lights and for other lights requiring great intensity, being constructed of single zones or rings, made up of segments according to the diameter of the required lens, has induced a belief that glass could not be prepared without incurring the expense of grinding and polishing the curved surface; and that economy dictated a method of manufacture embracing a centre and zones or segments. The necessity daily shewn for the more general application of a dioptric lens to the purpose of a sea-light—including, under

that name, either revolving or stationary coast-light, bay-light, bar-light, ship signal-light, deck and between deck-light, port-light, and all other lights for ships, tide-light, floating-light, and coast, harbour, and river-light generally; and also of a land-light—including, under that name, railway locomotive-light, carriage-light, ferry-light, and as applied to architectural purposes, and, in fact, to any purpose where an intensity of light is required—induced the inventor to examine the method of construction of the "built-up lens," with a view, at least, to reduce the expense without diminishing the strength of the light. Commencing with the suggestions of Buffon, that a spherical body, from its thickness, absorbs light in proportion to its density, and that a sectional figure, of any required shape and thickness, could be cast of vitrified material or glass, and ground in steps or concentric zones to produce a lens (as executed with partial success by the Abbé Rochon), the present inventor considered that, from the expense incidental to the accuracy required in grinding and polishing the steps or zones, the lens of Buffon was beyond the reach of the million. The experiments of the Abbé Rochon, however, were useful in preparing the way for the manufacture of the dioptric lens in separate pieces, which was subsequently accomplished by the ingenious Fresnel, after the suggestions of Condorcet, producing the lens known as the "annular band lens," at the present time in use in several lighthouses, and in which the spherical aberrations are nearly corrected, by making the foci of each zone to coincide. Although of great utility, the enormous expense of making the annular band lens of Fresnel (in which not only each separate piece must have its surfaces formed with great accuracy, but all the several pieces must be fitted to each other, so that, when put together, they shall constitute a perfect whole) has limited the use of this otherwise valuable and desirable invention to a very few localities.

The object of this invention is to produce a dioptric lens, which shall present all the practical advantages of the annular band lens of Fresnel, and at so cheap a rate as to admit of its being applied to all purposes requiring intensity of light. And, to this end, the invention consists in a new manufacture of dioptric lenses, made in one or several pieces, moulded and pressed to the form required for the surfaces; and, when made in several pieces, the required fit of the several parts being produced by giving the reversed required form to the metal moulds in which the molten glass is to be put, and into and by which it is to be pressed.

In Plate II., fig. 1, represents, in vertical section, the apparatus employed for making a lens. *a*, is a circular mould, to receive the melted glass; *b*, is a follower, which rests on the mould; and *c*, is a plunger, that fits in the follower *b*, and is intended to spread the melted glass uniformly into the mould *a*, by pressure. This construction of mould, plunger, and follower, and the mode of using them, are well known to glass manufacturers. The mould may be made of any figure required; and the follower and plunger will be made to correspond with the mould. The mould *a*, instead of having the concentric central lens and rings, may present a plain surface; and the plunger *c*, may have on it the rings and figures shewn in the mould *a*. The shape of the mould may be changed to any figure, whether convex or concave with the central zones or rings. The mould, instead of being made in one piece, may be made, sectionally, of as many separate rings or zones as there are designed to be rings or zones in the lens, or otherwise sectionally divided, according to convenience,—a suitable allowance in the diameter of each being made for the increased aggregate diameter, by reason of the parts being distinct; and, in such cases, the moulds for the separate rings and zones being laid together, and secured in their proper order, will form the entire mould; while the interstices, left between the separate pieces, will answer the same purpose as the holes at the angles of the zones, subsequently described: viz., to suffer the air to escape when the pressure is applied. If it should be desired (as it may be in the case of very large lights) to cast the lens itself in sections, the several sections may be moulded and pressed as described above, and then the whole cemented together in the usual way.

Fig. 2, shews, in perspective, a six-sided lantern; and fig. 3, is a transverse section of the same in the line 1, 2, of fig. 1. Each side of the lantern contains a lens, having a convex centre and several sections of zones or rings. This lens may be made in three pieces, *d*, *e*, *f*, which will require three separate moulds; or the whole may be cast together in one mould. Any required number of lenses may be combined together, after the manner shewn at figs. 2, and 3. The cap *g*, of the lantern may vary in shape, and may be made of any suitable metal.

Fig. 4, is a vertical section of a hanging or hand-lantern, formed by fitting a stand, lamp, top, and ring, to a dioptric cylinder *h*, containing several zones or rings, of regular and irregular widths, which can be varied at pleasure, and may be manufactured of any length or circumference. If required,

each lens may be made with one or many zones or concentric rings, according to the diameter,—the lens or segment of a lens being produced, as shewn and described, by pressure in a mould, with or without "fire polishing." To promote focal intensity, and to prevent the absorption of light, it will be obvious that each lens should be manufactured as thin as the size and number of concavities and convexities will permit. It is not essential to lay down any rule for thickness, or for the size, as the intensity will be decreased by density; and therefore the thickness will be governed by the extent of surface required.

In the making of dioptric lenses, sharpness at the angles of the zones is of the utmost importance; and, to effect this object, it may be found necessary to form, in the angles of the mould, apertures (so small as to be nearly invisible to the naked eye) for the escape of air from the cavities of the mould; otherwise atmospheric air may be confined in such cavities: and, when pressure is applied, the air thus confined will prevent the glass from entering and assuming the required form of the sharp angles of the mould. When that part of the mould which forms the curved surfaces of the zones is made in sections, sufficient space can be left between the different zones for the escape of the air.

The patentee claims the manufacture of dioptric lenses of glass, in one or more pieces, by pressure in metallic moulds, substantially as specified.—[*Inrolled October,* 1852.]

To James Nasmyth, *of Patricroft, in the county of Lancaster, engineer, and* Herbert Minton, *of Stoke-upon-Trent, in the county of Stafford, china manufacturer, for certain improvements in machinery or apparatus to be employed in the manufacture of tiles, bricks, and other articles, from disintegrated or pulverized clay.*—[Sealed 26th April, 1851.]

This invention relates to the manufacture of bricks, tiles, quarries, and other similar articles, from disintegrated or pulverized clay, by compression, in suitable moulds or dies; and it consists of a certain arrangement of machinery or apparatus for effecting the said object in a more perfect, economical, and expeditious manner than has been attained by the methods heretofore employed for that purpose. Hitherto this object has been effected by the employment of what is termed a screw or fly-press, or by an hydraulic press. But as

it is requisite, for the due consolidation of the clay, that the air existing betwixt the particles thereof should be forced out, before the clay attains its final degree of compression,—and as, in order to effect this object, it is necessary that the motion of the fly-press should be very slow at the commencement of the compression, for the purpose of allowing time for the discharge and escape of the air from betwixt the particles of the clay,—it is found, by experience, that this slow working of the fly-press is incompatible with the accumulation of such an amount of momentum in the fly-wheel as will produce the required amount of pressure. It is, therefore, necessary to perform the compression or consolidation of the pulverized clay at two or more successive swings or vibrations of the fly-wheel or fly of the screw-press: whereby a considerable amount of time is lost, and the work is but imperfectly performed, with great expenditure of unnecessary labor or power. In order to remedy or obviate these defects, the patentees have invented a certain arrangement of machinery wherein, by the employment of continuous rotary motion, as the condition of one prime movement, they are enabled, not only to bring the pressure on to the disintegrated or pulverized clay, in the first instance, in a slow and gradual manner, so as to allow of the escape of the air from betwixt its particles, but also to terminate the consolidating or compressing action with the advantage of accelerated speed and the accumulated momentum of the fly-wheel of the machine. Also, by the peculiar arrangement of the apparatus, they are enabled to employ a certain portion of the prime rotary moving power for the purpose of discharging each tile, brick, or other article (after it is formed), and also for refilling or charging the mould, after each successive operation, with fresh pulverized or disintegrated clay; so that the several operations of charging the mould or die, discharging the air, consolidating the tile, brick, or other article, and discharging the same from the mould or die, may be performed continuously, whilst the prime moving force or power proceeds without intermission.

In Plate I., fig. 1, exhibits a front view of the improved arrangement of machinery, as applied to the manufacture of flat tiles or quarries; and fig. 2, is an end view of the same, partly in section. *a*, is the framing of the machine. *b*, is a small steam-engine, whereof *c*, is the crank-shaft, and *d*, the fly-wheel; and the shaft *c*, is coupled to the main driving-shaft *e*, of the machine, by means of the spur-gearing *f, f*, imparting a continuous rotary motion thereto. *g*, is the hopper, in which the disintegrated or pulverized clay is placed;

and *h*, is the feeding or measuring-plate, for supplying the requisite quantity of clay-dust to the mould or die at each successive operation. This plate *h*, is capable of sliding horizontally upon the table *i*, and is brought alternately under the hopper *g*, and over the mould *k*, by means of a lever *l*, which is keyed upon a shaft *m*, and has an intermittent vibratory motion communicated to it by another lever *n*, keyed upon the same shaft, and furnished, at its end, with a pin or roller that works in the groove of the cam *o*, upon one end of the main driving-shaft: this is the feeding motion. The pressing motion consists of the upper die or plunger *p*, which is capable of sliding in a vertical direction in suitable guides, and is actuated by means of an excentric rod *q*,—the upper part whereof embraces an excentric *r*, keyed upon the main shaft. The discharging movement of the machine is as follows:—To the spur-wheel *f*, upon the main driving-shaft, is cast, or otherwise attached, a cam *s*, in the groove of which runs a friction-roller *t*, attached to the upper end of a sliding bar *u*; and this bar *u*, actuates a lever *v*, which vibrates upon a centre at *w*, and is connected, at its other end, to the discharger *x*.

The following is the operation of the machine,—supposing the plate *h*, at the commencement, to be standing with its opening beneath the hopper *g*:—As the main driving-shaft continues to rotate, the cam *o*, by means of the levers *l*, and *n*, will slide the plate *h*, in the direction of its arrow (carrying with it a charge of pulverized clay, and pushing before it the last finished tile) until the opening therein arrives immediately over the mould *k*; and the discharger *x*, is then lowered, by means of the cam *s*, bar *w*, and lever *v*,—the mould and the charge of clay following. The plunger *p*, is now brought down by the excentric *r*, slowly at first, and gradually accelerating, until it has reached the middle of its course of descent; and then the downward motion of the plunger gradually becomes slower, till it has arrived at its lowest point, when, by the continuous motion of the excentric, the plunger, in like manner, returns to its highest upward position. The plate *h*, is then brought back to receive a fresh charge; and the discharger *x*, rises, until the surface of the mould is level with the surface of the table *i*. The operation now proceeds as before. Although the above machine is shewn and described as actuated by a small steam-engine attached, yet it will be evident that continuous rotary motion may be imparted thereto, from any adequate motive power, in any other convenient manner; and it will also be evident that the same machine

may be readily adapted for manufacturing bricks or other articles. The patentees further remark, that, where it is thought desirable still further to assist the discharge of the air from the pulverized clay, the whole apparatus may be placed in a chamber from which the air has been exhausted: the dimensions of the hopper should, in that case, be considerably increased.

The patentees claim the employment or use of mechanical power, in the condition of continuous rotary motion, to produce a reciprocating action, for the purpose of consolidating or compressing disintegrated or pulverized clay into the form of tiles, bricks, and other like articles, and to perform the other several functions of the machine successively, as above described; and also (if preferred) the placing of the said press, when employed for the purposes above named, in a chamber from which the air has been exhausted.—[*Inrolled October*, 1851.]

Scientific Notices.

ON THE ADMINISTRATION OF JUSTICE IN PATENT CAUSES.

The amelioration effected by the new patent law, in the condition of poor inventors, by opening up to them a means of securing to themselves a beneficial interest in their discoveries, presents at greater disadvantage than before the excessive cost of defending, by law, the rights conferred by letters patent; while, at the same time, it renders collisions between rival manufacturers more likely to occur, from the simple fact of the increase in the number of interests which the reduced cost of patents must inevitably create. It may not therefore be thought ill-timed, seeing that the fervour for law reform is unabated, and that the first sessions of a new parliament (which is ever a season of hope) has scarcely commenced, to call public attention to the inadequate means at present in force for dealing out justice to inventors and manufacturers, who, in relation to their class interests, are liable at all times to be called upon to figure, either as plaintiffs or defendants, in our courts,—not only to their own direct injury, from the costs which may be imposed on them, but also, indirectly, to the detriment of the public at large. No one can doubt the expediency of affording cheap and speedy justice; and, though tardily, it has at last been

acknowledged as a general principle, by influential members of the legislature, that the expenses attendant on the administration of justice in our civil courts should not be imposed upon the suitors themselves.* If, however, all court fees, and other incidental charges consequent on the present practice of deciding questions of infringement, were abolished, there would be but little mitigation of the evils of which patentees have long and deservedly complained. It is not our purpose to analyze the costs of this class of actions at law; but, when it is remembered what amount of bodily and mental labor the active spirit to whom belongs the duty of "getting up" the case (as it is termed) has to undergo; the talent that it is found necessary to bring together, both in the form of advocates and scientific witnesses; the models of machinery required (if the question refer to some mechanical matter), or the experiments to be followed out for many weeks before the trial comes on (supposing it be a chemical case), in order to elucidate points that must or may arise in the course of the enquiry—when, we say, it is remembered what sums of money these several items involve, it will surprise no one that patent cases are the costly luxury which fame reports them to be. These are undoubtedly the main channels by which the suitor's purse is drained; but hitherto there have been other receptacles into which his substance has leaked, in no inconsiderable quantities. For example:—Let us suppose an aggrieved patentee has served notice on an infringer to desist from making, using, or vending his (the complainant's) invention, and that this notice, although coupled with a significant allusion to the consequences of continuing the infringement, has produced no effect, the patentee would naturally suppose that his opponent was in possession of some information tending to impugn the invalidity of his claims. To satisfy himself therefore upon this point he would apply to the Court of Chancery for an injunction to restrain the infringer,—not so much with the hope of thereby settling the question, as for the purpose of getting at the particulars of the defence which he would have to meet when the matter was brought on for trial. This preliminary step would involve the payment of court fees, attorney's and counsel's fees, for drawing and settling affidavits, consultations, &c., fees to scien-

* In relation to this subject, Lord Brougham is reported to have made the following statement in his place in Parliament last sessions:—"The State was bound to provide the suitor with the means and facilities for obtaining justice, and had no right to lay one fraction of a farthing upon him in that respect. On that point, he considered the immortal protest of Bentham against law taxes was unanswerable."

tific witnesses, fees on counsel's briefs, fees at affidavit office, office copies of defendant's affidavits, &c., &c.; and the end of all this complex story would be, a reference to another tribunal, to try the merits of the case. The new patent law, among other benefits conferred upon inventors, has swept away this costly and unnecessary proceeding,—firstly, by enacting that, "In any action in any of Her Majesty's superior courts of record at Westminster and in Dublin, for the infringement of letters patent, it shall be lawful for the court in which such action is pending (if the court be then sitting; or, if the court be not sitting, then for a judge of such court, on the application of the plaintiff or defendant respectively), to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such court or judge may seem fit." Secondly, the necessity for applying for an injunction is removed, by it being compulsory that, "in any action for the infringement of letters patent, the plaintiff shall deliver, with his declaration, particulars of the breaches complained of in the said action; and the defendant, on pleading thereto, shall deliver, with his pleas, particulars of any objections on which he means to rely at the trial, in support of the pleas in the said action; and, at the trial of such action, *no evidence shall be allowed to be given in support of any alleged infringement, or of any objection impeaching the validity of such letters patent, which shall not be contained in the particulars delivered as aforesaid.*" We have here, then, two very important concessions to justice and common sense. 1st. In that the courts, before which questions of infringement are brought, will not only have the power of granting injunctions, but that they will be enabled to get at the facts of a case, so as to settle it in a satisfactory manner; and, 2nd. In that the plaintiff and defendant will be equally well informed upon the case which they are called upon to answer. But, though this new practice, supposing it to be carried out according to the spirit of the law, will undoubtedly avoid the surprisals, and consequent tripping up of cases, which occasionally occur—an example of which was recently presented in the action of Hancock *v.* Bunsen,* where the wrong defendant was proceeded against—yet it is very obvious that the objection to the trials of patent causes, so far as the incidental expenses already glanced at are concerned, still obtains, because these are, as yet, untouched by the legislature; nor

* See Vol. XL., p. 237, Lond. Jour. of Arts.

do we see any means, so long as the present system is maintained, of mitigating the evil. It has been proposed, as a remedial measure, that patent cases should be turned over to the County Courts; but such a transference would be simply an absurdity; for, if the incompetency of the presiding judges to deal with a branch of law which could not have come under their cognizance while practising at the bar, did not make an appeal to their courts virtually a game of chance, and so, by a course of injustice, put down litigation on such questions altogether, it must follow that the engagement of the same talent, whether of counsel, attorneys, or scientific witnesses, would involve the same outlay, no matter what the court in which they are called upon to appear. It would seem, then, that excellent as are the alterations which the new law makes in judicial proceedings, yet the root of the evil is thereby left untouched. We may still expect to find grasping patentees complaining, without a shadow of foundation, of infringers, and mercilessly dragging them before a court of law; or, on the other hand, we may see stolid infringers, confident in their own ignorance of law and its consequences, ridiculing the just complaints of patentees, and urging them on, by defiant boastings, to do their worst. To meet this class of cases, when springing out of the ordinary transactions of social life, has evidently been the design of Lord Brougham, in his earnest endeavours to impress upon the legislature the necessity of instituting Courts of Reconcilement, similar to those which are to be found under various modifications in France, Switzerland, Denmark, and other countries of Europe. The nature and operation of these courts may be gathered from the following passage of an able letter on law reform, addressed to Lord Denman, and published at length in a recent number of the *Law Review*:—"Surely," says Lord Brougham, in this epistle, "no one can doubt that, if the parties in every case were to come unattended by any professional man before a judge, and hear his opinion upon their several contentions, a vast proportion of groundless claims and groundless defences must be immediately stopped, with hardly any expense incurred; and those causes only come on for trial in which, whether on matter of law or of fact, there was a real ground of dispute—a matter that ought to be tried. When this consummation shall crown the efforts of our statesmen and lawyers, they may truly enjoy that most delightful of all gratifications, the consciousness that they have really promoted the happiness of their fellow creatures." Many objections might be urged against the

establishment of such courts, both on the ground of the inability of the parties interested to state their own case with even tolerable clearness, and of the presiding judge not possessing a knowledge of trade practices, on which causes will often hinge—to say nothing of the contradictory statements that would most frequently be made by the contending parties. There is however little doubt that the office of public peacemaker is one that is capable of extensive application, in the settlement of private disputes of various kinds. But, for the institution of Courts of Reconcilement, legislative enactments are required; and Acts of Parliament (with the exception of taxing Acts) are not, as the public know to their cost, of spontaneous production. There requires a long process of incubation before the expressed will of the people finds an exponent in the Statute Book; but the need for reform is urgent; while the probability of Parliamentary aid is doubtful. When, however, a project that is capable of being carried out by private arrangement, or the voluntary acts of individuals, is once settled upon as desirable, the fact of its wanting legislative recognition should not delay its execution. That the settlement of questions relating to the infringement of patents might be effected in a satisfactory and economic manner by a court instituted by inventors themselves, has gradually assumed with us the shape of a settled conviction, which has been in no degree shaken by the general dissatisfaction manifested at the verdicts of juries, and the great importance attached to the retention of the most able advocates. The belief so frequently expressed by patentees, that a jury of scientific men was necessary, to try questions involving scientific points, is a sure index that some reform in the settlement of questions arising out of patents, apart from economical considerations, is earnestly desired by the parties most interested in the matter; and the ridicule with which such suggestions have been received by legal authorities, if it proves nothing else, clearly indicates that a change of system is not to be looked for in that quarter. All men who have served on juries must have felt, when some simple civil case touching upon his own business or profession, has been brought before him, with what ease he could have adjusted the dispute, single-handed, were it divested of the halo of confusion which it had received from the hands of the legal practitioners to whom it had been entrusted. There were, we will say, no matters of fact in dispute between the litigants; but all that was required was, a solution of the simple question—Am I liable, according to the custom of

the trade or profession, or does such and such a circumstance release me? In cases of this nature, the Courts of Reconcilement, proposed by Lord Brougham, would be of vast service; but is it not the fact, that the evidence on which patent cases chiefly turn, exists in such a shape that it can neither be denied by the plaintiff, nor fabricated by the defendant? Take nine cases out of ten, in which a plaintiff's pretensions are defeated, and we shall find that his defeat has arisen from the production of office copies of specifications of a date anterior to that of his patent. Again, when do we find that the defendant denies that what is produced in court as the infringement complained of is really his manufacture? By the present practice, however, nothing is admitted that can be avoided; and hence the prolixity and complexity of lawsuits; but, in reality, the defendant would never deny his own acts. Let us see what are the points in general raised in an action for the infringement of a patent, and we may then more easily determine the kind of faculty required in the adjudicator to meet and settle these points. The case of Tetley *v.* Easton and Amos (given at page 52, of the present number of our Journal) will serve as a fair illustration. The plaintiff had set a particular construction on the wording of his specification; and, by that mode of defining his invention, he clearly made out to his own satisfaction that the defendant's manufacture infringed on his rights. Now this deduction might be false from two causes;—1st, the value put on the wording of his specification might be illogical; or, 2ndly, the interpretation might be just, but the wording itself false;—that is, the claims might be too large, by the virtual claiming of a natural law; or they might be too large when interpreted according to the full power of the language employed, by reason of their embracing some known matters forming part of certain prior patents; or, again, the specification might be defective. In either of these cases, though the defendant had infringed what was really new, the plaintiff would, according to the present law, lose his action. It must be manifest, that neither of these subtle points can properly come under the cognizance of a jury. They are all (with the exception of the last assumption, viz., a defective specification) matters for the judge, who, if he be dull at mechanics, will find himself puzzled with the language and diagrams that may be perfectly clear to mechanicians. The action referred to was, fortunately, tried by a judge fully equal to the case; and thus a fair construction was put upon the plaintiff's specification, and on the documents which were relied upon by

the defendants. But what part did the jury or could the jury play in this drama? It is evident, in the greater proportion of instances, that jurors feel such matters to be beyond their knowledge, and therefore they very properly take their cue from the presiding judge. Let us suppose a case in which the merits of the specification, both as respects its sufficiency and the novelty of the improvements it describes, are indisputable, and what, under such circumstances, is left for the jury?—The case now resolves itself into the simple question of likeness or unlikeness between the manufactures of the two litigants. Models, we will assume, are before the court, and witnesses, chosen for the purpose, are produced by both sides, to contradict and nullify, as is customary, each other's testimony. To resolve the difficulty thus created, it cannot be said that the jury have to determine which group of witnesses is most deserving of credence; for, with scientific witnesses, it is not matters of fact, but opinions, that are in dispute;—the judge, therefore, steps forward to aid the jury—detects the false grounds on which certain of the witnesses have based their opinions, and directs the jury, in such a general way as to avoid absolute dictation, to the verdict to which the evidence should bring them. If this be a fair statement of the nature of patent causes generally, and the mode of conducting them, it is clear that the jury is literally a cipher, so long as their verdict is in accordance with the opinion of the bench. On the contrary, when their verdict is adverse to that opinion, it is ten to one that the jury is far worse than a cipher—that it is an obstruction of justice. To what then does our enquiry lead?—simply to this fact:—That all questions which arise out of patent rights, and involve subjects demanding scientific investigation, are, when tried by a judge fully equal to the task, to all intents and purposes, decided by his single voice. What therefore is *virtually* done by one master mind, fully equal, by reason of his education, to grasp all the points of the most complex case, why may it not be *nominally* effected by him likewise,—and that without parade—none but the interested parties being present? The scheme which we would propose, in anticipating a legislative enactment, for the removal of the grievances under which patentees and others connected with new inventions, labor, in respect of the cost, delay, and uncertainty of lawsuits arising therefrom, may be thus briefly set forth:—Let a society be formed, consisting of engineers, manufacturers, and inventors, who, as a qualification to membership, shall bind themselves to refer all disputes arising out of patents in which they may be concerned, to an adjudicator or ad-

judicators, nominated by the society. A council of not less than ten members, to be elected annually, to conduct the affairs of the society, and to appoint one or more adjudicators either from amongst their own members, or from professions kindred to the objects of the society—to examine into and dispose of all questions of infringement that may be referred for settlement; the contesting parties severally binding themselves to abide by the decision, unless a majority of the council is of opinion that the case is deserving of further investigation. Under such circumstances, the aggrieved party is to have the option of referring the matter back again to the same arbitrator, or to another, or to the first, assisted by one, and never more than two, arbitrators, appointed by the council; or of carrying it before a court of law: such transfer of the case to a court of law being admissible only on the condition specified; but otherwise disqualifying the litigant from belonging to the society. The mode of proceeding would be simply this:—The complainant should set down, in writing, the nature of his grievance, and forward it to the council, whose duty it would be to acquaint the alleged infringer with the particulars of the complaint, and request a written answer thereto,—and, if he be not a member of the society, whether he will consent to have the matter settled by arbitration, provided the council consider a sufficient case has been made out by the complainant to go before the arbitrator. If the reply is not completely satisfactory, or if it raise questions of detail beyond the province of the council to investigate, and the defendant consents to the reference, then the plaintiff shall be instructed to set forth, in detail, the grounds of infringement, and to nominate witnesses, who are ready to be examined on his behalf. This document, of which two copies should be furnished, one for the council to lay before their arbitrator, and the other for the use of the defendant, will be tantamount to the brief now prepared for counsel. The defendant shall then be requested to prepare, in like manner, his answer to the plaintiff's case, and transmit a copy of the same to the council. The whole matter being now before the arbitrator, his duty will be to call any or all of the witnesses named in these documents before him, and question them on such points as he may think require further explanation—taking down their answers; and, if needs be, requiring the depositions to be sworn to before he receives them as evidence. He would thus have a mass of reliable facts before him. With such data it would be for him to decide upon the whole case, which he would be required to do in writing, setting out the reasons therefor, after the man-

ner of the Judges when deciding on appeal cases. The value of the arbitrator's opinion would thus be made evident to all the world; and, assuming his reasoning to be just, we apprehend there would be few appeals against his judgment. On the other hand, if his inferences were palpably wrong, the facts collected would still be ready for use, in case of an appeal to a second arbitrator. The selection of the arbitrator by the council would ensure to the contending parties an unbiassed choice, and the reference of their case to a party competent to master the technicalities, and seize the vital points which it may present; for it should be a rule in the selection of an arbitrator, that, besides being versed in the law of patents (a qualification necessary under all circumstances), he should not be ignorant of the branch of manufactures to which the case to be brought before him refers. It may be asked, Where are we to find gentlemen competent to undertake these arduous duties? We would answer, that if they did not exist already, the necessity would make the men. Our faith in the abilities of our countrymen is deservedly great, because they have never yet been found to fall short in any one science or art; it would, therefore, be manifestly ungracious to meet our scheme with an objection of this nature, even if there were apparent grounds for the implication. We could, however, of our own knowledge, enumerate several gentlemen who, both from the analytical character of their minds, and the nature of their pursuits, are fully qualified for such duties as we have marked out for the arbitrators of questions arising out of patents for inventions. With respect to the details of our scheme, they are open to adjustment in any way most convenient: for instance, the payment of the arbitrator might devolve on the council, who might be provided with funds for that purpose, by the annual subscription of members; or his expenses might be defrayed by the losing party. These are things of minor importance, but not so the advantages which might be expected to flow from this society. A great point would be gained by drawing inventors and manufacturers together, under a common bond of union, and bringing the acts of individuals under the surveillance of that body, with whom they must ever be most desirous to stand well. This circumstance alone would stop a large amount of oppression—such as, forcing "little men" to take licenses under an invalid patent, to avoid being driven into a court of law to establish its invalidity; and again, setting at nought the just claims of a patentee, when he has not the pecuniary means to enforce his rights. A great moral power would be created thereby, suffi-

cient to hold offenders of this class in check; and thus, much injustice would be prevented, without recourse being had to our new court of judicature. But, supposing a case to be called on for arbitration, it would, according to our plan, receive the most searching investigation; and that at a cost little, if at all, exceeding the present expenses in preparing the case for counsel; while, be it remembered, if the case were eventually carried before a jury, the labor which had been undergone in getting up the documents for the arbitrator, would be available for the trial; nor would the defendant's position be damaged by his opponent knowing the whole of his case; for, by the new law, as we have already shewn, he is bound to particularize the nature of the objections on which he intends to rely. We have drawn attention to this subject, from a conviction that a necessity exists (which will soon be most evident) for an immediate alteration in the system of adjudicating on patent privileges, arising partly from the dissatisfaction which patentees have heretofore expressed at the expenses incurred in "holding their own"; but chiefly from the fact that the New Patent Law has called forth a class of inventors, whose pecuniary means are barely sufficient to cover the preliminary expenses of the patent. To give a right, and not to defend the holder of that right, is little more than a mockery; yet how can government do this for patentees, and withhold the like privileges from other classes of the community? It is, however, in the power of inventors to effect for themselves what the government is debarred from attempting; let them, therefore, no longer complain of their peculiar hardships, lest, like the man in the fable, who put up his petition to Jupiter, to get him out of the slough, they be rebuked with the advice—to put their shoulders to the wheel and help themselves.

INSTITUTION OF CIVIL ENGINEERS.

November 30th, 1852.

The evening was entirely devoted to the discussion of Mr. RAWLINSON'S paper, "*On the drainage of towns.*"

The town of Hitchen was given as an example, where 60,000 feet of pipe sewers, from 20 inches diameter downward, had been in action for four months with perfect success: the average depth below the surface was 8 feet; and the outlet of the main sewer, which was 5000 feet in length, and only 20 inches in diameter, was laid beneath the bed of the river, at an inclination of one in eight hundred. This was designed for the sewerage of one thou-

sand houses, of which only two hundred were at present connected, and eleven hundred acres of urban and suburban drainage. It was admitted that some of the pipes, laid to a pumping-engine, had broken, from being laid in bad ground; but, after being re-laid in wooden troughs, they had answered well,—that the system of pipe sewerage had been, and must be, modified in practice to adapt it to certain localities,—that in a rocky uneven bed, loaded pipes would necessarily break; and, if of large dimensions, they were very liable to be split longitudinally, or fractured transversely, as it was very difficult to get them accurately made and burned, and the false bearing of the sockets caused breakage. If, in the case of Hitchen, the rule laid down by Mr. Roe had been followed, the outlet must have been 5 feet diameter, instead of 20 inches diameter.

In the instance of Manchester, where, during the last eight years, a great extent of oval pipe drains, 25 inches by 18 inches, had been laid with success, it was explained, that they were 2½ to 3 inches in thickness, and were laid with great care in very strong ground;—the maximum size at which, even these thick pipes were preferable to brick sewers, was 36 inches by 24 inches. The smallest size made for small streets was 12 inches by 9 inches, and for foul water only 6 inches by 4 inches. The largest area draining into a pipe sewer was fifty acres.

The case of Croydon was mentioned, where, in consequence of the breakage of the pipes, it had been found necessary to excavate down to them, apply a covering of clay, and turn a ring of 4½ inches brickwork over them. It was shewn, that this breakage had, in a great degree, arisen from the system of alternate tunnelling and cutting, which caused unequal settlement of the earth on the pipes, under which they were certain to be fractured. In some cases they had been found to be softened, by exposure to water, and then crushed under the superincumbent weight,—causing stoppages of the flow, and rendering necessary the opening of the ground to reach them.

It was admitted, that for pipe drains, laid at a depth of 15 feet, 12 inches or 15 inches diameter, was the utmost limit of practical utility; above that size, brick sewers would be preferable—particularly if hollow bricks were used. A brick sewer of 3 feet diameter would cost as little as a pipe drain of 20 inches diameter. The latter had only been adopted at Hitchen, on account of local difficulties, which were, by these means, more readily met.

It was contended, that the ordinary rain-fall must be provided for in the size of the sewers, or else great injury to property must constantly ensue—that, with due precaution, there was little actual danger in excavating between houses for large sewers—that in sewering a town, the ultimate expense must be the main consideration; and if the streets were to be constantly torn up, to discover stoppages, not only would the expense be much increased, but the inconvenience it would cause would be incalculable. It was incorrect to say, that no fecal matter entered the sewers at

Paris, when it was notorious that all the barracks, hospitals, prisons, and many other public buildings, were directly connected with the sewers; and at their outfalls, into the Seine, the evidences of this connection was plainly discernible. Numerous instances of stoppage were quoted; and specimens of the pipes, partially stopped up, were exhibited. In cases of gradual stoppage, from the matters always present in house-drains, it was very difficult to detect the actual spot, and great expense of digging up, and breakage of joints, &c., ensued. None of this occurred where good sized main sewers were built, up which men could pass periodically, to remove obstructions, or commencements of accretion, and make early repairs, to prevent degradation from neglect.

At Liverpool, the borough engineer, who had great experience, had, since 1847, built seventeen miles of sewers, of which there were 29,360 yards of brick, varying from 6 feet by 4 feet to 2 feet 9 inches by 1 foot 6 inches, and only 587 yards of pipe drains of 15 inches and 12 inches diameter.

It was stated, from Mr. Roe's reports, that experience had shewn the cost of cleansing small pipe drains to be greater than the expense of constructing an efficient sewer; that no amount of water sufficed to cleanse a small pipe drain, if it once became stopped; but that in a large sewer, flushing and other means could be effectually adopted, without any inconvenience, on the surface.

The accordance between the practical results of Mr. Roe's tables, and Mr. Hawkesley's formulæ, was examined; and it was shewn, that where the former would lead to the adoption of a sewer of 48 inches diameter, the latter gave 49 inches diameter; and, in another case, the approximation was as near as 120 inches to 124 inches:—in both instances the formulæ gave the largest area.

It was contended, that the condition of a town, wherein provision was only made for conveying away the foul house water, &c., by pipe drains, would be deplorable, in cases not only of sudden falls of rain, but of a continued period of rainy weather;—such a state being unworthy of the intelligence and skill of the present day.

Instances were given of the failure of pipe drains, at Edinbro', where, after a trial of a year, they had been abandoned, and it had been decided to replace them by brick sewers;—chiefly on account of the repeated stoppages, and the consequent inconvenience to the public from breaking up the streets.

Numerous experiments were given, as to the transverse strength of pottery pipes: an 18-inch pipe, 2 feet long, resting in curved blocks at the ends, bore 53 cwt.; one, 9 inches diameter, bore 64 cwt. It was stated, that no practical difficulty existed in making perfectly vitrified pipes, up to 18 inches diameter. Failures had chiefly arise from bad manufacture, bad material, or inadequate thickness.

An instance was given of a case at Kilburn, where a great

number of pottery pipes, 15 inches diameter, were found to have become filled with clay, through a small hole in one of them; and many of them were broken from unequal subsidence of the earth rammed upon them.

December 7th, 1852.

The discussion was resumed on Mr. Rawlinson's paper "*On the drainage of towns*," and was extended to such a length as to preclude the reading of any paper.

It was assumed, that the object of the discussion was not to determine whether large sewers were superior or inferior to pipe drains, but to consider the broad question of the most efficient system of drainage for towns—to ascertain the value of the general maxims that had been laid down, and the influence they might have on the sanitary condition of the country. In doing this, any allusion to public boards would be only made by quoting from their published documents, and to the extent only of the opinions they had broached in their public capacity.

It was argued, that where by any operations of man the natural outfall had been altered, it became necessary to provide a free subterranean, or other competent outlet, for the rain-fall; and thus the original destination of sewers had been only for carrying away storm waters. The addition of house drainage was a modern refinement on the system; and it became necessary either to combine both in one comprehensive system, or to have two separate means of conveying away the rain-fall and the foul house water, &c. It was then contended, that, as main arteries, brick sewers possessed direct and collateral advantages over any other mode of construction; and that small pipes were chiefly useful as feeders, and could not prudently be extended beyond connections between houses, courts, and the main recipient sewer. The simple conclusion appeared to be, that small pipes were useful in houses, and for short distances, but not useful as part of an arterial system of draining—that the sizes of drains must be regulated by attention to all the conditions which might arise; and they should be such as to convey away, with sufficient rapidity, all the foul house drainage and the ordinary rain-fall.

Some speakers contended, that at Richmond, at Rugby, and other places, the system of small pipe sewerage had been eminently successful; but others contended, that the number of houses hitherto connected with the main sewer was very small,—that the construction of the works had been so recent, as not to afford practical experience of their permanent sufficiency,—and yet that stoppages had repeatedly occurred, and the amount of breakage had been considerable. Also, these recent operations, in small places, did not afford data for the construction of sewerage works, applicable to the very different conditions, and circumstances, of important cities and populous towns.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

THE GENERAL MEETING of the Members was held at the house of the Institution, 54, Newhall Street, Birmingham, 27th October, 1852, ROBERT STEPHENSON, Esq., M.P., President, in the Chair, when the following paper, by Mr. SAMUEL H. BLACKWELL, of Dudley, was read:—"*On the arrangement of the materials in the blast furnace, and the application of the waste gases.*"

The use of the waste gases given off from the top of the blast furnace, has been long known and adopted in many of the continental iron works. The higher cost of fuel, and the greater attention paid to a scientific knowledge of the most important processes of manufacture, led to the use of the waste gases of the blast furnace in the works of France and Germany, long before their application here. The United States soon followed the example of the Continent; and in the iron works of Pennsylvania, for some years past, the use of the waste gases has been general. The object of this paper is to point out some of the causes which have prevented their more general use in England in our great iron works, and to call attention to some light thrown, by the attempts to use them, upon the best arrangement of the materials in the furnace.

The first attempt to apply the gases in our iron works was made at Ystal-y-Fera, in South Wales, by Mr. Budd, who obtained a patent for their use.*

The method of employing them was at first defective, from the direct flame of the furnace being taken off instead of the gases themselves. The moment the gases emerge from the top of the furnace, and unite with the atmosphere, ignition takes place; and if the flame is to be economized, it must be immediately applied to the surface upon which it is to act, or its heating power is given off and consequently wasted. The attempt therefore to apply flame, necessitated the erection of the boilers, or of the pipes in which the blast was to be heated, in immediate contiguity with the tunnel head. In many works this was a matter of great difficulty, and in very few could it be done without inconvenience. Even where practicable, the flame always acted powerfully upon the passages through which it passed, and exhausted itself, in proportion to their length and absorbing powers, before it became available at the points where it was really required. This difficulty led to such an alteration in the arrangements adopted, that instead of the flame, the gases themselves could be drawn off from the materials in the furnace, before they had become ignited by mixing with air. For this purpose a cylinder of cast or wrought iron, resting by a broad flange upon the upper part of the lining

*For description of this invention, see Vol. xxix. of our present series, p. 268.

of the furnace, was carried down into the interior of the furnace to a depth of several feet beneath the top of a horizontal pipe, through which the gases passed off. The diameter of the furnace expanding from the top downwards, an open space was thus enclosed between the inside wall of the furnace and the cylinder, forming a reservoir for the gas, into which, as long as the cylinder was kept full, no air from above could enter.

This arrangement perfectly answered its purpose, as far as taking off the gases unignited; and although they still passed off at a high temperature, the loss of heat in the passages was much diminished, being confined to simple radiation from the hot but unignited gas: however far it was carried, its chemical nature remained unchanged, and atmospheric air was allowed to mix with it only on its reaching the point where the heat given off in its combustion became available. All difficulty in placing either the pipes for heating the blast or the boilers was thus obviated; but there remained two sources of inconvenience. First, a very powerful draft, was required to be given by a sufficient height of stack to draw of the gases with regularity; and second, the entire quantity which it was possible to draw off, under the most favorable circumstances, bore only a small proportion to the entire quantity generated in the furnace—the greater part of which still escaped through the open cylinder.

Where a powerful stack was at hand, and where it was not a matter of importance to economize the entire amount of gas generated, this arrangement was in many instances satisfactory. It was not, however, always so; in many works it was found impossible to get the furnaces to work well after the gases were taken off; great fretting of the twyeres, accompanied by frequent scaffolding and slipping in the furnace, was constantly producing irregularity in its working;—the quantity made would thus be much decreased; and, after much annoyance, the attempt to use the gases was in such cases generally abandoned, as productive of more inconvenience and loss than economy. This was much more the case in South Staffordshire than in Wales. In the former district it led, after three or four trials, all with the same result, to its complete abandonment. It was difficult to understand the cause of this great irregularity in the results obtained, which at first seemed inexplicable; but this cause is now believed to be fully understood.

In the year 1849, two furnaces in Derbyshire were placed in the writer's hands, from which the gases were taken off for the purposes of heating the blast. The furnaces worked with considerable regularity whenever the heat could be properly maintained, but this was not constantly the case, in consequence of the opening into the gas flues being situated so near the top of the furnace that, when the wind was in certain directions, the gas did not pass off with regularity, or if it came off in sufficient quantity, it was so mixed with atmospheric air that it burned down the

passages, and thus occasioned great inconvenience. The writer determined upon obviating this by covering the opening into the gas flue with a wrought iron cylinder. The tops of the furnaces were small, and only admitted of cylinders of the respective sizes of 4½ feet and 6 feet being employed. This effect was perfectly satisfactory, in enabling a regular supply of unignited gas to be obtained; but the furnace with the 4½-feet cylinder began to scaffold and slip; the twyeres were exceedingly troublesome; and the weekly make fell off considerably. After a trial of one or two weeks, the cylinder was taken out, other means were adopted to prevent the gas taken off from becoming ignited, and the furnace again resumed its former regularity. The furnace into which the 6-feet cylinder had been placed, worked far better, but not quite satisfactorily; and upon the cylinder burning out, it was not replaced,—arrangements being made similar to those adopted in the other furnace. It will not be necessary to describe these arrangements, as arrangements similar in principle, but improved by subsequent experience, will be afterwards described. Both furnaces have worked ever since satisfactorily, and the gases taken off furnish all the heat required for heating the blast,—no slack whatever having been used for some years for the purpose.

It was evident from this trial, and from similar results at other works, that the irregularity did not arise from the mere abstraction of the gases themselves; and there was only one other cause to which it could be attributed, viz., the narrowing of the filling part of the furnace; and the question then arose, in what way did this operate? The first suggestion that presented itself was naturally that the effect produced arose from decreasing the area through which the gases generated in the furnace were given off, and thus causing greater obstruction to the free passage of the blast. This explanation was soon found to be untenable.

The saving effected in some of the Welsh works by the use of such portion of the gases as could be economized by the use of the cylinders employed there, led to a wish to make the entire quantity of gas generated available, by closing the top of the furnace, and not allowing any gas to escape into the open air. This was first effected by Mr. Levick, at the Cwm Celyn Works. In the arrangement adopted by him, two cast iron bearers extend horizontally across the furnace, at a depth of about seven feet below the top; and upon these a cone of cast iron is placed,—the base of the cone being less than the diameter of the furnace. A short cylinder about three feet and a half deep is suspended from the filling plate, resting by a flange (as in the case of the cylinders previously described) upon the lining of the furnace; and a second cylinder of about the same depth rests upon the base of the cone. This second cylinder is larger than the first, and being moveable around it, can be lifted by means of two bars of iron or chains, attached to it, and passing through openings made for the purpose in the flange of the upper cylinder. The pipe for the passage of

the gases extends horizontally from the upper part of the interior of the furnace. When the lower cylinder rests upon the cone, the top of the furnace is closed in entirely, and the space inside the two cylinders can be filled with the materials constituting the charge. Upon lifting the lower cylinder, the charge immediately falls into the furnace round the base of the cone; and the cylinder being again lowered, the top is once more closed in.

Another arrangement for effecting the same object, was soon afterwards adopted at the Ebbw Vale works. In this arrangement an inverted and truncated hollow cone is fixed in the top of the furnace,—resting on the lining by a flange, similar to those employed to suspend the cylinders. The truncated end is closed by another cone, the apex of which ascends through it; and this closing cone is suspended by a chain, passing over a pulley, by which it can be lowered or raised at pleasure. On the lower cone being raised, the furnace is closed, and the materials wheeled into the upper cone; and when the moveable cone is lowered again, the materials at once drop into the furnace. This arrangement is now in full operation, and working satisfactorily at several of the works belonging to the Ebbw Vale Company. Both at these works, and also at the Cwm Celyn Works, the furnaces with the closed tops work well; they carry equal, if not better burdens than those which are open; they work with equal regularity, and make an equal quantity of iron. The area through which the gases are taken off is in some cases not equal to that of a 3-feet pipe, and much less than that of the smallest of the cylinders which produced such unfavorable results. Consequently, the injurious action of these cylinders could not arise from the decreased vent permitted to the gases, nor to any obstruction in the blast. The only other way in which the cylinders could produce any effect would be by causing the materials filled into the furnace to fall too much towards the centre of the furnace,—thus producing an arrangement of them, which in some way acts prejudicially upon its general working. By the action of the cones, the materials wheeled into the closed furnaces are scattered round the side of the furnace, and are thus arranged as they would be in open furnaces with wide tops. It thus became at once obvious that cylinders in Wales had been productive of less injurious consequences to the general working of the furnace than those in Staffordshire, because the greater width of the Welch tops had permitted cylinders of from 8 to 10 feet to be employed, whilst in Staffordshire only cylinders of much less size were practicable.

The important effect produced on the working of the furnace, chiefly by an alteration in the arrangement of the materials in the furnace, is a point of considerable interest, but one to which little attention has been hitherto paid. In practice it has been long known to the best managers of furnaces, that wide tops were desirable, and generally accompanied by increased make; but the precise manner in which wide tops acted was not clearly known until

the attempt to use the waste gases led to its evident explanation. On the continent, the importance of such arrangement of materials as would facilitate the passage of the blast, as nearly towards the centre of the furnace as practicable, has been known for some time and acted upon; and the writer was much pleased to find from M. Tunner, Professor of Metallurgy, in Austria, and connected with the Styrian Iron Works, that great increase of make had followed the adoption of wide tops to the charcoal furnaces of that district, combined with a method of filling, by which the coke or charcoal was placed in the centre of the furnace, and the ore and bimestone around the sides.

Some few months back a furnace was placed in the writer's hands, which he found provided with a cylinder and other arrangements for taking off the gases. Although apprehensive that the cylinder would materially interfere with the working of the furnace, yet, as everything was arranged for it, and as it was six feet in diameter, he determined to blow it in without alteration. This was done—the expected result following,—constant slipping, and fretting twyeres, with all their attendant bad results. The stacks were not powerful enough to draw off the gases, unless a closed top was used; and the writer therefore adopted an arrangement somewhat similar to the Ebbw Vale one. The result was immediate; the furnace worked with great regularity, and carried a good burden; but white iron alone was produced. The burden was lightened, but the iron remained white. A farther lightening of the burden was made; but although the cinder was exceedingly grey, still the iron was white. It became evident that a greater proportion of coke would not produce the desired change, and was in fact useless. The white iron was evidently the effect of the closed top. A pipe of nine inches diameter was inserted at the filling place, but with no effect. Another pipe was inserted, and some little change appeared.

It being important to produce grey iron, it was now determined to sacrifice the use of the gases entirely, rather than continue to make white iron. A lid or valve upon the main gas-pipe, and a covering on the top of an auxiliary gas-pipe were now opened to the atmosphere, and a decided change was at once evident. The iron became grey and the furnace worked with regularity. The white iron had evidently been caused by the pressure produced by the closed top; and so extremely sensitive did the furnace appear to be to the slightest restraint, upon the free passage of the gases, that even a strong wind blowing into the open box, through which the gases were principally escaping, would throw the furnace back to white iron.

In Wales, where the closed tops are successfully employed, the production of white iron is rather sought for, and hence the tendency in closed tops to produce that quality is no disadvantage. In many cases, however, it must be a fatal objection to their use. But for this objection closed tops would become universal; as they

entirely do away with the necessity for a lofty stack, and enable all the gases to be economized. That the tendency to produce white iron has no connection with the mere abstraction of the gases from the furnace is clearly shewn by the results of the Scotch furnaces, in which they are taken off without employing closed tops. At Dundyvan, especially, great attention has been paid to this point; and the result has shewn that the furnaces from which the gases are taken, work with equal regularity, and produce grey iron with equal facility to those from which the gases are not taken; and it would be easy to multiply instances of the same result.

The manner of taking off the gases at Dundyvan is as follows:—The furnace is 42 feet high, and 12 feet in diameter in the centre; it begins to contract at 12 feet from the bottom, to form the boshes and hearth,—the hearth being 7 feet wide at the bottom; and it also begins to contract at 8 feet from the top, which at the filling-plate is eight feet wide. Below the contracted part last named, there are eight flues four feet high, and eighteen inches wide, placed at equal distances from each other, and leading into an annular chamber that extends round the furnace and is continued up to the filling-plates, by which it is closed. The pipe for the passage of the gas is placed nearly at the top of this annular chamber. Sometimes the entrances to the flues are covered by a wrought-iron cylinder, ten feet wide, resting on a flange, let into the lining of the furnace at a depth of from five or six feet below the filling-plates, so as to leave a circular space between the cylinder and the lining of about twelve inches width. Although this arrangement works satisfactorily, it is doubtful whether the cylinder is necessary, and, indeed, it is more than probable that it would be destroyed before the furnace had been long in blast. In many furnaces with open tops, from which the gases are now taken, the use of the cylinder has been abandoned altogether, as needless. Where not used, it is however quite necessary that the openings into the flues should be at a sufficient depth from the top of the furnace, to prevent the possibility of the admixture of the gas with atmospheric air. To effect this, a depth of ten, twelve, or even fifteen feet, is sometimes adopted with advantage. The gases pass off more readily at these depths, in consequence of the greater resistance of the superincumbent materials, and they are in a more suitable state for heating purposes.

The most able investigations of the nature of the gases of the blast furnace are those of M. Ebelmen, and almost all the knowledge we possess of their chemical composition will be found in a paper communicated by him to the "Annales des Mines," in 1851, and which contains, not merely a *resumé* of M. Ebelmen's own investigations, but also an examination of those of Messrs. Bunsen and Playfair, as reported to the British Association.

From M. Ebelmen's experiments it would appear that the first action of the blast upon its entrance into the furnace through the twyeres is to produce carbonic acid, by the union of the oxygen of

the atmosphere with the carbon of the coke: this is accompanied with the intense heat required for the fusion of the iron ore. The carbonic acid, as it passes upwards, is converted into carbonic oxide, by contact with the carbon of the incandescent coke above the zone of fusion. As the carbonic oxide ascends higher in the furnace, it acts as a reducing agent upon the oxide of iron of the ore, by uniting with the oxygen, by which a considerable portion is again converted into carbonic acid. The gases emerging from the top of the furnace are therefore, from the result of the chemical action now detailed, and also from the carbonic acid liberated from the limestone used as flux, more highly charged with carbonic acid than those which may be taken off at a lower point; and consequently, to the extent of this greater proportion of carbonic acid, they possess less heating power. Where, therefore, only a portion of the gases are taken off, as in the case of open tops, the depth of the flue is important, in reference to the quality of the gas taken off, as well as to its freedom from any admixture with atmospheric air.

In this notice of Ebelmen's experiments, all attention to the composition of the gases, except in reference to their heating power, is purposely omitted.

The results, at which we may be now said to have fully arrived, are the following:—1st.—That the waste gases may be used with great economy in raising steam and heating the blast. 2nd.—That they must be taken off in such a manner as to prevent their mixing with atmospheric air before they arrive at the place where they have to be applied. 3rd.—That this may be effected in two ways, either by placing the openings for taking them off sufficiently below the surface of the materials in the furnace, or by closing the filling part entirely. 4th.—That the first plan is the most desirable where grey iron is requisite; but, where adopted, it is necessary that a powerful draft should be obtained by a sufficiently lofty stack. 5th.—That, when thus taken off as gas, they can be conveyed to any distance proportionable to the power of draft available, without losing any of their calorific power beyond that lost by simple radiation,—the whole of the calorific power to be obtained from their combustion being economized, until atmospheric air is admitted to them at the point where the heating effect is required. 6th.—That no arrangement of the filling place should be permitted which reduces that part to less than eight feet diameter,—from nine to ten feet, according to circumstances, being generally the most advantageous.

The Chairman enquired whether it had been ascertained what was the temperature of the gases when drawn off from the furnaces?

Mr. Blackwell replied that it was not accurately known, but it would not be very considerable, as the gases were not ignited. In one mode of carrying out the principle that was adopted in

France, the gases were actually passed through water after leaving the furnaces, to separate all impurities and injurious matter, and also to prevent any risk of explosion. In that case, the only heat lost would be the temperature of the gases in coming from the furnace before they were ignited.

Mr. Mc Connell noticed that it was stated in the paper that a greater proportion of carbonic oxide was found at one height than at another, and enquired whether any experiments had been made to ascertain the height from which to get the best result?

Mr. Blackwell replied that from twelve to fifteen feet below the top was the greatest depth that he was aware of such a trial having been made. Carbonic acid was generated at the bottom, as the product of combustion, in the neighbourhood of the twyeres; after rising towards the centre of the furnace, the carbonic acid became converted into carbonic oxide, by taking up carbon from the mass of incandescent fuel, and carbonic oxide prevailed there; but higher still the carbonic oxide reduced the iron ore, and much of it became carbonic acid again. At the top of the furnace there was a considerable proportion of carbonic acid, with a portion of carbonic oxide; but in the centre of the furnace there was carbonic oxide alone.

Mr. Slate enquired whether, if only carbonic oxide existed in the centre of the furnace, any experiments had been tried for drawing off the gases from the centre, instead of taking them from the top?

Mr. Blackwell did not know of any experiments having been made for taking the gases from the centre of the furnaces; and he believed that fifteen feet from the top was the lowest that had been tried; but it must be observed that, in all probability, if the gases were drawn off at a lower level it would reduce the yield of the furnace; because the carbonic oxide was required to reduce the ore of the metal, and it would take away so much of the reducing power of the furnace.

Mr. Slate remarked that the practical effect would then be to shorten the furnace, and to work with a very short furnace was known to be bad. He suggested that perhaps the reduced make of furnaces with closed tops was due to the reduction of the quantity of air entering at the twyeres, on account of the resistance to the discharge from the top of the furnace being increased, which would tend to diminish the quantity of air blown in by the same blast engine.

Mr. Blackwell did not think that was the case, as it was not always the consequence that the yield was reduced by closing the top of the furnace: at Cwm Celyn a rather greater yield was found with a closed top to the furnace than when open. It must be borne in mind, that from the different composition of the ores in different districts, the plan might succeed in one case, when it would not in another.

Mr. Gibbons remarked that the Staffordshire ore required a double proportion of limestone compared to the Scotch ore, and therefore more carbonic acid was generated in the blast furnace.

In answer to questions from the Chairman, Mr. Blackwell stated, that at the Ebbw Vale Works they were raising the steam for the blast engines entirely by the waste gases from the furnaces, and also heating the blast; and, for these purposes, from 15 cwt. to one ton of coal would otherwise be wanted for each ton of iron made. The action was found less destructive to the boilers than the ordinary fire; because the heat was very uniform, and the boiler was not exposed either to fluctuations in temperature or excess of heat.

Mr. Slate observed, that the saving of the consumption of slack in South Staffordshire would amount only to 6d. per ton upon the iron, owing to the small cost of the coal usually burnt under steam-boilers.

Mr. Blackwell said, that of course there was a great difference in the value of slack with different qualities of coal. In South Staffordshire, from the slack not having a caking quality, it could be used only for steam-boilers and inferior purposes; but in South Wales, most of the refuse slack was a valuable material for making coke, which increased its value very much, and made the saving an important consideration. In reply to a question from Mr. W. Mathews, he said that he had had the plan in operation for three years in some furnaces in Derbyshire; and during that time no instance had occurred of repair being required in the hot-air apparatus; but it had to be opened about every six weeks to clear away the deposit of dust. He understood, however, that at the Dundyvan Works a considerable loss of heat appeared to be caused by the thick coating of the pipes with dust.

Mr. W. Mathews remarked, that he had lately been over the Dundyvan Works, in Scotland, where the gases had been applied more extensively than elsewhere, and was informed by the manager that he considered they would be as well without this plan, as they found it had a very prejudicial effect on the heating pipes, though less perceptible on the boilers. In Wales, they appeared to be using the plan with considerable advantage, on account of the greater price of fuel and coal slack. In South Staffordshire he thought it doubtful that it would be found advantageous. A very slight interference with the regular working of furnaces would be a serious prejudice both to the quality and yield of iron, and would more than counterbalance any economy arising from the application of the gases.

The Chairman enquired what was the nature of the dust that was found to collect so rapidly on the pipes of the hot-blast apparatus?

Mr. Blackwell replied, that the chemical character of the dust

was not at present well understood; but that the effects alluded to by Mr. Mathews arose simply from the mechanical action of the very large quantity of minute dust given off from the furnace, which could not be cleaned from the surface of the heating pipes so well as from the surface of the boilers,—the draft not being sufficient to prevent it from being deposited on the surface of the pipes.

Mr. McConnell enquired whether the dust could not be removed by drawing the gases through a screen of wire-gauze, so as to filter the air before entering the hot-blast apparatus?

Mr. Blackwell replied, that the passage for the air from the furnace should be as free as possible, and the wire gauze would cause too much obstruction. In the French works that had been referred to, the air was carried through water to stop all dust and impurities, which appeared to accomplish the object successfully.

The Chairman asked whether Mr. Blackwell agreed with M. Ebelmen's theory of carbonic acid being first produced, then changed to carbonic oxide, and lastly partly converted to carbonic acid again, higher up in the furnace? He could not understand such a process.

Mr. Blackwell said he did not consider himself competent to give any opinion upon the chemical changes occurring in the furnace: he considered the theory a probable one, especially as it appeared to be fully confirmed by M. Ebelmen's experiments, in which the gases were taken off at different heights of the furnace, and subjected to careful analysis.

The Chairman said he could not think that the carbonic oxide took up an atom of oxygen from the oxide of the metal: it was a law of chemical affinity, that the second atom combines with less force than the first He considered it much more probable that an atom of carbon was taken from the carbonic oxide to unite with the iron; he did not think that the carbonic oxide could de-oxidize the iron; and he could not understand the two reverse processes taking place at the same time in the furnace.

Mr. Blackwell said, that when in the Exhibition, accompanied by M. Le Play (one of the Jurors of the Exhibition, and Professor of Metallurgy in Paris) and Professor Faraday, he saw some curious specimens, called "metallic sponge," which were formed of pieces of iron ore exposed, when heated, to a current of carbonic oxide, or carburetted hydrogen, which de-oxidized them. M. Le Play was acquainted with the process before, but it was new to Professor Faraday, who was much interested with the specimens. He (Mr. Blackwell) had not seen the process of de-oxidation, but was informed that it was effected by both means, either by carbonic oxide or by carburetted hydrogen.

Scientific Adjudication.

COURT OF EXCHEQUER, WESTMINSTER,

Before Chief Baron Pollock.

Dec. 2nd & 3rd, 1853.

TETLEY *v.* EASTON AND AMOS.

THIS was an action for the alleged infringement, by Messrs. Easton and Amos, the engineers, of The Grove, Southwark, of a patent granted to the plaintiff, Mr. Charles Tetley, of Horton, near Bradford, on the 11th February, 1846, for "improvements in machinery for raising and impelling water and other liquids, and also thereby to obtain motive power."

The Attorney-General (Sir F. Thesiger), Mr. Atherton, and Mr. Webster, appeared for the plaintiff; and Sir Alexander Cockburn, Mr. Hindmarch, and Mr. Groves, on behalf of the defendants.

The Attorney-General, in opening the case, stated, that the invention for which the plaintiff had obtained a patent, consisted in a peculiar construction of rotary pump, acting upon the centrifugal principle. In this pump, a hollow wheel, having radial arms or spokes, is carried by a solid shaft, and put into rapid rotary motion by a strap passing over a pulley keyed to the shaft. The boss of this wheel is continued on either side; thus forming a hollow shaft, which is the channel for conducting the water from the supply-trunks into the hollow wheel; whence it is expelled by the action of centrifugal force, and, passing out at the extremities of the radial arms, falls into any required receptacle. When, however, it is desired to force the water up to a greater height than about 30 feet, the wheel is set in an air-tight chamber, into which air is pumped, for the purpose of putting a greater pressure than the ordinary atmospheric pressure upon the water, and thereby causing it, as it is discharged from the wheel into the chamber, to pass therefrom through an exit-pipe, and mount to the required height. This part of the invention, however, is only needed for high lifts; in other cases the air-tight chamber may be dispensed with. It was not pretended that, at the date of the plaintiff's patent, raising water by centrifugal action was new; but the principle of balancing the wheel, that is, equalizing the frictional pressure of the wheel, by causing the water to enter at both sides thereof, was a new feature,—and, as such, the plaintiff was entitled to the exclusive use of the balanced wheel. In the year 1851, amongst other wonders at the Great Exhibition, the plaintiff's attention was drawn to three centrifugal pumps, attracting considerable notice, one of which displayed a placard to this effect:—"Not patented; given to the public;—invented by

J. G. Appold; manufactured by Easton and Amos, engineers, The Grove, Southwark." On examination, he found that this pump (which, by its extraordinary performances, gained the exhibitors the large Council Medal) possessed that most important feature of his invention—the balanced wheel; and he immediately apprised Mr. Appold of the fact. After further enquiry, he found that the defendants were carrying on an extensive business in the manufacture of what they termed Appold's pumps. Among other places, they had, as he should prove, set up this construction of pump at Whittlesea Mere, and at Selby; and, although made aware of the plaintiff's patent, they had refused to acknowledge his claims; he was therefore driven to a court of law to defend his rights. The learned Counsel then proceeded to call witnesses in support of his case.

Mr. Charles Tetley said, that, early in the year 1845, he invented and constructed a centrifugal machine for raising water. The wheel had a pressure of air on the opposite side to that at which the water entered; and there was consequently an amount of friction created, which, had it not been got rid of, would have rendered the arrangement useless. After trying various contrivances, he discovered that, by admitting water at both sides of the wheel, the wheel was perfectly balanced, and was rendered capable of raising double the quantity of water. In December, 1846, he completed his patent pump, and set it at work in a foundry-yard at Bradford,—at the same time advertising it in the local and the London papers, in order to call public attention to his invention. Among other persons who witnessed its performances, was a Mr. Diggle, a contractor, who had attempted, unsuccessfully, to clear out the water from a coffer-dam surrounding the pier of a viaduct then erecting over the river Wharve. An examination into the working capacities of the pump induced Mr. Diggle to entrust the emptying of the coffer-dam to the plaintiff, which operation he undertook to perform for £300. The pump, when at work at Bradford, discharged 2,000 gallons of water per minute; but by the substitution of curved arms for the radial spokes, it was enabled to discharge 4,000 gallons in the same time. In 1847, plaintiff set up another pump in a tunnel of the Leeds and Thirsk Railway; but it was found that, from the nature of the ground, the use of a pump was not required; and, since that time, no demand had been made for his improved pump. The witness then proved the exhibition, at the Crystal Palace, of Appold's pump, which was explained to him by Appold, and was acknowledged by the defendants to have been manufactured by them. In November, 1851, saw Appold's pump at work in Whittlesea Mere. On cross examination, he said he did not know Hale's pump by name. Being shewn the drawing of Hale's specifications for raising water, dated, respectively, January 12th, 1830, and October 13th, 1831, he acknowledged he had seen something very similar. He considered there was no centrifugal

action in Hale's first patent. The second plan was quite new to him. The first part of his (plaintiff's) invention referred to the raising of water up to the discharging wheel by suction. Prior to his patent, this had not been done to wheels taking the water in at both sides. He admitted that the use of a solid shaft, for carrying the wheel, might be old; and that the capacity of suction-pipes is commonly larger than the valves. The wheel he sometimes works in water without the use of a case. The curved blades he had employed are not mentioned in the specification. He should not, in general, raise the water higher than the wheel; but, by raising the sides of the box in which the wheel works, so as to allow the water to accumulate, a greater elevation might be attained. Mr. Hawksley, hydraulic engineer, examined.—Considered Tetley's invention new at the date of the patent, and sufficiently described in the specification. The balance of the wheel was an important feature; without this, the rotary pump would be inferior to the common force-pump. If the wheel were submerged, it would raise water, provided it were placed in a case. He had seen the several infringements complained of;—in each a balanced wheel was employed; there was no material difference between them and the plaintiff's. Cross examined.—The balance effect is obtained, besides the admission of water on both sides of the wheel, by an air-pipe communicating with opposite ends of the hollow shaft of the wheel. The solid shaft is common to fan-blowers and paddle-wheels: Appold uses no hollow shaft. In relation to the seventh claim, he said the law relating to the suction-pipes had been carried out before. Did not know of collapsable-valves having been previously applied to pumps. Has not seen Delap's patent of May 1st, 1821. Admitted that "Clark's blower," if inserted in water, would take water at both sides of wheel, and drive it through exit-pipe. Mr. Bower, in the employ of Messrs. Forester, of Liverpool, examined.—Inspected plaintiff's machine at Bradford; considered it new; and, in other respects, confirmed Mr. Hawksley's evidence. Mr. Diggle, on being called, confirmed the evidence of the plaintiff, respecting the utility of the invention, as demonstrated in the clearing of the coffer-dam, which operation was effected in a quarter of an hour. Mr. Carpmael, civil engineer, examined.—Is acquainted with centrifugal pumps generally. Tetley's draws water on both sides of wheel, whereby a state of equilibrium is obtained. Had inspected the models before the Court: each contains a revolving wheel, furnished with recesses or passages, and mounted on a solid axis, in a state of balance, identical with plaintiff's. When the suction-pipes of plaintiff's machine are removed, the wheel is brought down to the water, and the water is driven upwards by the elastic pressure of the compressed air. This was the plaintiff's case.

Sir Alexander Cockburn, before opening the defendant's case, called his lordship's attention to several points relating to the construction of the specification. Near the end of his specification

the patentee says, "I do not claim to be the discoverer that liquids may be raised by centrifugal force, nor do I claim, in any way, the sole application of machinery for raising water or other liquids by centrifugal force, except only when the same is used as a means of introducing liquids into compressed air or other elastic fluids, as specified hereafter in my fifth claim." Now this, he submitted, overrides all the other claims;—whatever claims, therefore, are made after this statement, they will be subservient thereto. The patentee confines himself to the use of centrifugal force, in connection with compressed air, which combination it is not even pretended that the defendants have employed. Then, in claim one, and in claim two, which is but a repetition of the former, he claims merely the balancing of the wheel; but at claim five, he claims the whole of the machinery employed. Again, the third claim is a specific claim for the solid shaft, and yet, in the body of the specification, he dispenses with it; thus leaving it doubtful what are really the essential features of the invention. Further on, at claim seven, he virtually puts in a claim to a natural law, and attempts to debar the world from making suction-pipes, of a sufficient capacity to afford an adequate supply of water to the discharge-wheel of pumps. His lordship having stated his intention to reserve the points which had been raised, the learned counsel proceeded to address the jury on the defendant's case. He stated that Appold's pump was the result of a compilation of known materials, skilfully effected—that if there were any similarity between Mr. Tetley's and Mr. Appold's pumps, it might well be accounted for in the fact, that both parties had gone to the same source for their materials. But there was really a marked distinction between the two; for Tetley's was essentially a wheel, with radial spokes, carrying collapsable valves at their extremities; whereas Appold's wheel has no radial spokes, nor hollow shaft; but the water is drawn in at the centre of the wheel, thrown up inclined planes, and delivered out at the periphery of the wheel. In support of the defendant's case, an office copy of Rumsey's specification, dated 1792, was put in evidence, shewing a wheel, having a hollow shaft and a solid axle,—the water being, however, admitted on one side only. Delap's specification, of 1821, was also put in, to shew the use of collapsable valves at the periphery prior to the plaintiff's patent; and office copies of the two patents of Hale's, already referred to, were likewise put in evidence, to shew that the claim for the balanced wheel was not maintainable.

The first witness called for the defence was George Castell, a mechanic, who exhibited a working model of a pump, constructed by himself, according to Hale's second patent, and set it in action. Mr. Cowper, engineer, proved the agreement of a model pump, having a solid shaft, with Rumsey's specification. Delap's specification, he said, describes collapsable valves, but does not shew them in the drawing. In Hale's first patent water is admitted at both sides of the wheel. The wheel would be balanced if admitted on but

one side; but being admitted on both sides it will deliver faster. Each plan shewn in Hale's second patent will produce centrifugal action. The models handed to witness correctly represent the case shewn at fig. 2, and the wheel at fig. 4, of Hale's drawing—the wheel having a central partition. The supply-pipes, at both sides, agree with the specification. The model made by the last witness, and exhibited at work, represents the arrangement shewn at fig. 5, of Hale's specification. Witness had examined the model of Appold's machine, at Selby; it works above the water, is very like Hale's, but has a rim at the edges of the wheel, to strengthen it. Clarke's blower works in a similar manner to Appold's wheel, and resembles it in construction, with the exception, that Appold's wheel has curved blades. He would not call the central hole in the wheel a hollow shaft. In Mr. Tetley's pump, if one supply-pipe were closed, the wheel would still be balanced; or if the pipe which conducted air from one side of the wheel to the other were removed, the balance would be maintained. He considered the description referring to the dimensions of the supply-pipe, was defective,—a term of the rule was wanting. The desirableness of a large inlet was well known and practised long anterior to Tetley's patent. [During Mr. Cowper's examination, the models of Appold's and of Hale's pump had been opened, and the wheels handed up to the bench.] The learned judge now attempted to stop the case, because he considered the patent could not be sustained. There were difficulties which appeared to him insuperable, and he would state them. The model now opened is the infringement complained of. The claim made by Tetley is this:—"In reference to the hollow wheel, I do not confine myself to the number or to the use of hollow spokes, but, in some cases, propose to substitute circular discs, with a narrow water-channel between, and a valve, or flexible valve or valves, on the circumference; and, generally, I propose to construct the wheel of every variety of configuration, so long as the same is constructed so as to have a channel or channels in the interior thereof, for the passage of liquids, and shall be adapted to neutralize the effects of motion, by having a corresponding or proportionate degree of motion at each side." Now Hale's patent is taken out for raising water by suction. He, the learned judge, had thought Mr. Tetley was impregnable, in lifting water above the ground. Hale left Tetley to use compressed air; and suction-pipes were the plaintiff's also; but Hale described suction-pipes. In Tetley's, the water, to enter the case, must pass through the centrifugal wheel; so also is it with Appold's and with Hale's. In Hale's arrangement, the central portion of the wheel is the continuation of the suction-pipe, and so also is it in Appold's and in Tetley's. Again, in Hale's, the water is expelled by the paddles or blades acting as a centrifugal force,—there is, in fact, centrifugal action in all Hale's wheels, and they possess curved blades like those of Appold's. On the plaintiff's counsel assuring his lordship that they could

shew a material difference between the wheels of Appold and Hale, the case was proceeded with. Mr. Amos, one of the defendants, examined.—He had made the pumps complained of. Appold's wheel was, practically, as useful without the discs (side plates) as with. Hale's pumps worked well with open ends. Prefers Hale's to Tetley's for all purposes. Had proved, by experiment, the inutility of side-plates; the rapidity at which the wheels were driven in the water, having the effect of inducing attraction of cohesion. Cross-examined.—The influence of the rotating-blades would carry round the water, unless the case containing the wheel was sufficiently excentric. Appold's was a modification of Hale's. The wheel at Selby had an edge around the central opening of the wheel, at each side thereof. Mr. Hann, Professor of Mathematics, at King's College, confirmed the evidence of Mr. Cowper, relating to the deficient description and want of novelty in that part of the plaintiff's specification which refers to the suction-pipes. Mr. Hensman, engineer to the Bank of England; Mr. Joseph Glynn, hydraulic engineer; and Mr. J. M. Napier, engineer, were also called, and confirmed the preceding evidence, particularly as respects the side-plates being non-essential, and the construction of Appold's and Hale's wheel being substantially the same.

The case for the defendants being now concluded, the plaintiff's counsel demanded the right to the re-examination of their witnesses, to meet the evidence given, as to the substantial identity of Appold's and Hale's pump, which latter, they contended, had been kept back to take them by surprise. After a good deal of discussion, this course was allowed, and Mr. Bower was recalled and examined.—He knew nothing of Hale's inventions at commencement of trial, but had since examined them, and found them to be materially different from Tetley's in these respects:—1. Hale's wheel could not be made without a case, while Tetley's would, in some instances, work better without a case. 2. Hale's has no channels complete in the revolving wheel. 3. The admittance of water on both sides of Hale's wheel, is perfectly useless, as a balancing against the effects of suction. Considers Hale's no better than the old pumps. Cross-examined.—Before yesterday did not know Hale's, nor any wheel receiving water on both sides. Has not tried Hale's. A complete channel is necessary in plaintiff's wheel; where no complete channel exists, the wheel is not Tetley's. Without cheeks, Appold's would be clear of Tetley's. Mr. Carpmael was then recalled; but, on stating that he had drawn Hale's specification, the Court refused to receive his evidence, on the ground that the plea of surprise could no longer be maintained; since the witness, who was in constant communication with the counsel during the whole case, and who appeared to have been conducting it throughout, might have spoken to Hale's patent at an earlier stage. Sir A. Cockburn, having replied on the new evidence, was followed by Mr. Atherton, who replied upon the

whole case, contending that the infringement was established; for the description of Tetley's wheel, while it did apply to Appold's, did not answer to Hale's; that the objection raised against the sufficiency of the specification was one of those which was often found to emanate from the stultified comprehension of philosophers in a witness box, who, when thus placed, were in the habit of falling into errors from which a common mechanic would be quite free; and that neither the solid spindle, the valves, nor the suction-pipes, were intended to be set up as distinct features of novelty. He was at issue with Mr. Appold, that he had invented nothing. If Hale's specification had not turned up, we should have had Clarke's blower put forward as fatal to plaintiff's claims. Some wheels, called Appold's, had been exhibited without discs; but those produced by the plaintiff had discs, and therefore it was of *them* that the jury were to judge: for whether the defendants could make wheels without discs work well, was a matter of which they had nothing to do.

The Chief Baron, in summing up the case, said, This is an action against the defendants for the infringement of a patent granted to the plaintiff in 1846. The utility of the invention in question is not denied, and if it were, the plaintiff's and Mr. Diggle's evidence would have set this aside. Probably no patent case ever came before a Court of Law so entirely free from objection, as respects the parties concerned. Mr. Tetley, having secured his invention by a patent, made a machine, and set it up at Church Fenton, but did nothing more with it. On visiting the Great Exhibition last year, he saw the defendants' pump, and said, this is my machine. There was no attempt to disguise the fact, that, if this was really an infringement of the plaintiff's patent, the defendants were liable. Now, there are several points which you have to consider;—those which have been left for the court I shall settle. The specification has been assailed, both on the ground of its insufficiency and its want of novelty. In Rumsey's patent of 1792, we are shewn a solid spindle, applied to a centrifugal pump. Many objections have been raised, in the course of the trial, to parts of the plaintiff's specification; and, in relation thereto, I may remark, that the modern practice of interpreting a specification differs from that which formerly prevailed. If it is intelligible to workmen, although not logically correct, that is, if it contain such evident errors as "imponderable substances," so long as no doubt exists of the meaning of the patentee, the specification must be held to be good. But there are objections which appear to me to be tenable; for the patentee, not content with a genuine claim, grasps at other things, which are not definitely set out; whereas the policy of an inventor is, to ask for a patent for what he has invented, and to leave it to the Court to protect him, and not to fence himself with wide claims. Now, Delap's specification describes collapsable valves. Then Hale's first patent shews various constructions of wheels, turning on

spindles, in a case which admits water. But Hale's second patent goes further. It appeared that as the plaintiff's patent was for raising water by suction, it did not meet the case of putting the machine in water: I thought therefore that the immersion of the wheel in the water was no violation of his patent; for the suction principle seemed to be his, as also the compressed air, which is beyond the question of infringement. Near the end of Hale's specification, however, he says, "In place of fixing the case in the water, there may be a suction-pipe descending into the well;" which leaves the question of suction-pipes open. The learned Judge then proceeded to describe the action of Hale's pump, by reference to the drawings; and also that of Tetley's, to shew that the plaintiff's claim would include Hale's arrangement. After dismissing the objection to the term wanting in the rule given for the dimensions of the suction-pipes, he referred to the objection raised on claims seven and nine, which claim the making of these pipes of a greater sectional area than the openings into the wheel. On that point, his Lordship said, I lay down the law to be this:—If pumps of this construction had not been made before, no one could use this enlarged pipe system in any pump, because the plaintiff claims that system of supply. The next point is, the plaintiff proposes "to construct the wheel of every variety of configuration." Now, an opening on each side of the wheel would resemble Clark's bellows. He also says, "In some special cases, I propose to have an entrance for the liquid into the wheel at one side thereof only, &c.;" and again, "If other gases, or elastic media other than atmospheric air, are used, with which to charge the case, I claim the sole right to do so." I have no hesitation in saying, that this is bad. A man can only claim that he can give to the public. Then, he says, "I do not confine myself to the use of hollow spokes, but propose to substitute circular discs, with a narrow water-channel between." When Hale's wheel (fig. 4,) is in its case (fig. 2,) there is a channel for passing water, within the meaning of the plaintiff's claim. A variation in Hale's is a circular disc. We are told, this is not like Tetley's; but then is Hale prohibited from putting sides to his wheel,—the effect of which, the witnesses say, is inappreciable in the working. Substantially, you will have to decide whether Hale, having a wheel in a case, has provided the defendants,—or has the plaintiff provided them with the materials constituting Appold's pump. We are bound to oppose the grasp of things not in the head of the inventor; and it is in evidence that he knew nothing of the value of curved arms at the date of his patent, and that their subsequent introduction doubled the working capacity of his wheel. What, therefore, you have to decide is—where did Appold get his principle of construction? If you believe it was from Hale, the defendants are entitled to your verdict; but if from Mr. Tetley, you will find for the plaintiff. The jury, after a short consultation, found their verdict for the defendants.

LIST OF GRANTS OF PROVISIONAL PROTECTION UNDER THE NEW LAW.

Cases in which a full Specification has been deposited.

John Gedge, of Wellington-street, Strand, for improvements in the mechanism of looms for weaving,—being a communication.—November 26th.

Jean Hyppolite Salvan, ainé, of Paris, manufacturer, for certain improvements in the manufacture of paletôts, and other articles of dress,—the said improvements being obtained by an improved process of felting and fulling.—November 26th.

Daniel Woodall, of Oldbury, in the county of Worcester, boiler maker, for improvements in canal boats.—November 27th.

Jules Barse and Paul Gage, of Paris, for improvements in apparatus for manufacturing soda water and other aërated liquids, and likewise in the preparation of the substances employed therein. —November 29th.

Andrew Edmund Brae, of Leeds, for an apparatus for stopping and detaining, or releasing and setting free, cords, tapes, chains, ropes, or othes flexible lines or strings.—November 30th.

Henry Jenkins, of Birmingham, die sinker, for improvements in the manufacture of bracelets, brooches, and other articles of jewellery.—December 8.

Emile Kopp, of Accrington, Professor of Chemistry, and Frederick Albert Gatty, of Accrington, manufacturing chemist, for improvements in printing or dyeing textile fabrics.—December 9.

David Lloyd Price, of Beaufort, South Wales, watch maker, for certain improvements in apparatus for effectuating alarums and signals by electricity.—December 9.

George Allen Everitt, of Birmingham, manufacturer, for improvements in rolling metal strips for the manufacture of wire.—December 13.

John Webb, of Coventry, manufacturer, for improvements in ornamenting enamel watch dials.—December 14.

Cases in which a Provisional Specification has been deposited.

572. Henry Brinsmead, of the parish of Saint Giles in the Wood, in the county of Devon, machine maker, for an invention for shaking straw, to be attached to thrashing machines.—[*Dated October 30th.*]

684. Thomas Dunn, of Pendleton, near Manchester, engineer, and William Watts, jun., of Miles Platting, near Manchester, assistant engineer, for improvements in the construction of railways.—[*Dated November 9th.*]

730. George Philcox, chronometer maker, Winchester-buildings, London, for improvements in marine chronometers and other time-keepers.

731. Edward Davy, of Crediton, manufacturer, for improvements in the preparation of flax and hemp.

733. John Caborn, of Denton, agricultural implement manufacturer, for improvements in corn thrashing and dressing machines.

734. Professor Andrew Crestadoro, of Darlington-place, Vauxhall, for improvements in rapid communications between distant places and countries.

735. Robert Lucas, of Furnival's-inn, mechanical draughtsman, for improved machinery to be used in the preparation of cotton and other fibrous materials for spinning,—being a communication.

736. Somerville Dear, of Leeds, machine maker, for certain improvements in the arrangement and apparatus of looms for weaving centre or other large patterns or designs in linen, cotton, silk, wool, or other fibrous materials.

737. John Paterson, of Wood-street, London, warehouseman, for improvements in apparatus for shaping collars and other similar linen and cotton articles.

738. Richard Coad, of London, and John Peers Coad, of Liverpool, for improvements in fire-places and means of applying heat.

739. Amory Hawkesworth, of Abbey-road, Torquay, for improvements in life-boats.

740. Admiral the Earl of Dundonald, of the Belgrave-road, in the county of Middlesex, for improvements in apparatus for laying telegraphic or galvanic wires in the earth.

741. Samuel Sedgwick, of Piccadilly, in the county of Middlesex, for improvements in lamps,

742. Hugh Greaves, of Salford, civil engineer, for improvements in the permanent way of railways.

743. Peter Forbes, of Shettleston, in the county of Lanark, millwright, for improvements in sowing or depositing seeds in the earth.

The above bear date November 13th.

744. Gray Denison Edmeston, of Salford, engineer, and Thomas Edmeston, of Crow Oaks, Pilkington, calenderman, for certain improvements in steam engines; which improvements are also applicable to the regulating of water-wheels or similar machinery.

745. James Hogg, junior, publisher, of Nicolson-street, Edinburgh, for certain improvements in machinery for producing glazed or smoothed surfaces on paper and other vegetable fabrics.

746. Joseph Cowen, of Blaydon Burn, near Newcastle-upon-Tyne, and Thomas Richardson, of Newcastle-upon-Tyne, for improvements in the manufacture of sulphuric acid.

747. Robert Reyburn, of Greenock, for improvements in the composition of lozenges and other confections.

748. Constant Jouffroy Duméry, of Paris, civil engineer, for certain improvements in the manufacture of metallic pipes and tubes, and in the machinery employed therein.

749. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in apparatus for inhaling iodine,—being a communication.

750. John Mirand, of Castle-street, Holborn, for certain improvements in the construction of electric apparatus for transmitting intelligence.

751. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for certain improvements in lamps,—being a communication.

752. George Berry, of Buttersland-street, St. Leonard's Shoreditch, for an improved method of roasting coffee.

753. Robert Sandiford, of Tottington Lower End, near Bury, calico printer, for certain improvements in apparatus for block printing.

754. William Fraser Rae, of Edinburgh, brass-founder, for improvements in gas-heating and cooking apparatus.

755. James Robertson, of Glasgow, cooper, for improvements in the manufacture of casks and other wooden vessels.

756. Francis Montgomery Jennings, of Cork, manufacturing chemist, for improvements in preparing flax, hemp, china-grass, and other vegetable fibrous substances.

757. Thomas Taylor, of the Patent Saw Mills, Manchester, for improvements in apparatus for measuring water and other fluids; which apparatus is also applicable to the purpose of obtaining motive power.

758. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in knitting machinery,—being a communication.

759. Abraham Rogers, of Field House, near Bradford, for improvements in apparatus used for forming sewers, tunnels, and ways.

760. John Dent Goodman, of Birmingham, merchant, for improvements in the boxes and axles for carriages,—being a communication.

761. Samuel Holt, of Stockport, Cheshire, for improvements in weaving cut piled fabrics.

762. Joseph Burley, of Halifax, mechanic, for improvements in apparatus for cutting fustians and other fabrics, to obtain a cut pile surface.

The above bear date November 15th.

763. Joseph Slatterie Edwards, corn and flour factor, Albion Mills, Blackfriars-road, London, for a self-acting pea-kiln or apparatus for moving grain, pulse, seeds, malt, or any similar substances while drying, which insures a more rapid desiccation, and requires scarcely any of the manual labor now employed in kilns, to be propelled by steam, water, or horse power.

764. Thomas Chrippes, the younger, of Petworth, in the county of Sussex, land agent, for improvements in the means of tilling land.

765. Joseph Johnson, of Wellington-quay, Dublin, for an improved mode of producing ornamental articles, such as brooches, bracelets, dressing and other cases, work and other boxes, or other like articles, from a certain kind of wood.

766. William Marsden, of Blackburn, cotton manufacturer, for certain improvements in and applicable to looms for weaving.

767. John Ramsbottom of Longsight, near Manchester, engineer, for certain improvements in steam-engines.

768. John Wheeley Lea, of the city of Worcester, chemist, and William Hunt, of Stoke Prior, manufacturing chemist, for improvements in utilizing the waste heat of coke furnaces.

769. François Vallée, of Brussels, manufacturer, for improvements in preparing, spinning, and doubling flax, cotton, wool, silk, and other fibrous materials.

770. John O'Keeffe, of Liverpool, rose engine turner, for a method for making watch-cases by machinery.

The above bear date November 16th.

771. John Thomas Way, of Holles-street, Cavendish Square, Professor of Chemistry, and John Manwaring Paine, of Farnham, Gent., for improvements in the manufacture of burned and fired ware.

772. Isaac Lowthian Bell, of the Washington Chemical Works, Newcastle-upon-Tyne, for improvements in the treatment of certain compounds of iron and sulphur.

773. Henry Russell, of Norwich, piano-forte maker, for improvements in piano-fortes.

774. John Hinchcliff, of Leeds, engineer, and Ralph Salt, of Leeds, engineer, for improvements in steam-engines.

775. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for certain improvements in weaving elastic tissues,—being a communication.

776. Francis Bresson, of Paris, civil engineer, for a new and improved mode of propelling on land and water.

777. William Watt, of Glasgow, chemist, for improvements in preparing for weaving, and in weaving flax and other textile materials.

778. Henry Vernon Physick, of Aberdeen-place, Maida-hill, civil engineer, for improvements in electric telegraphic apparatus, and in machinery or apparatus for constructing the same.

The above bear date November 17th.

779. James Rock, the younger, of Hastings, carriage builder, for improvements in buffers.

780. James Potter, of Manchester, machinist, for improvements in machinery for spinning cotton and other fibrous substances.

781. James Hume, of Birkenhead, plumber, for improvements in water-closets.

782. John Venables Vernon and John Edge, both of Manchester, engravers to calico printers, for improvements in apparatus and machinery for engraving rollers of glass, copper, brass, and other metallic compounds.

783. George Hamilton, of Paisley, North Britain, bleacher, for improvements in spreading or distributing starch, gum, and other semi-fluid matters.

784. Robert Walker, of Glasgow, merchant, for improvements in the construction of portable houses and other erections.

785. Peter Carmichael, of Den's Works, Dundee, for improvements in machinery for winding yarn or thread.

786. John Burgess, of Rastrick, in the county of York, dyer, for an improvement in dyeing wool.

787. Moses Poole, of Serle-street, Gent., for improvements in the manufacture of seamless garments and other seamless fabrics,—being a communication.

788. William Williams, of Birmingham, patentee of electric telegraphs, for improvements in electric telegraphs.

789. George Perry Tewksbury, of Boston, in the United States of America, for an improved life preserving seat.

790. Benjamin Nickels, of Albany-road, in the county of Surrey, for improvements in the manufacture of adhesive plaster.

791. Richard Kemsley Day, of White Cottage, Plaistow, for improvements in the manufacture of fuel for lighting fires.

792. Charles de Bergue, of Dowgate Hill, in the city of London, for improvements in the permanent way of railways.

793. John Robert Johnson, of Stanbrook Cottage, Hammersmith, for improvements in the manufacture of type or raised surfaces for printing.

794. Moses Poole, of Serle-street, Gent., for improvements in cementing matters in the production of ornamental and other forms and surfaces,—being a communication.

795. Henry Bessemer, of Baxter-house, Old St. Pancras-road, for improvements in apparatus for concentrating cane juices and other saccharine solutions, and in the treatment of such fluids.

796. Henry Bessemer, of Baxter-house, Old St. Pancras-road, for improvements in the crystallization and manufacture of sugar.

797. Henry Bessemer, of Baxter-house, Old St. Pancras-road, for improvements in the treatment of washed or cleansed sugar.

798. Jean Joseph Jules Pierrard, of Paris, manufacturer, for improvements in preparing wool and other fibrous substances for combing.

799. Henry Bessemer, of Baxter-house, Old St. Pancras-road, for improvements in apparatus for concentrating saccharine fluids.

The above bear date November 19th.

800. Richard Taylor, of Clayton-bridge, Newton-heath, near Manchester, calico printer, for certain improvements in heating dye cisterns and soap cisterns, used in the process of calico printing.
801. John Trestrail, of Southampton, for improvements in raising sunken vessels or other materials from under the water or in the sea, or to prevent them from sinking.
802. John Brettell Collins, of Birmingham, factor, for a new improved flooring cramp or lifting-jack.
803. James Nasmyth, of Patricroft, near Manchester, engineer, for certain improvements in machinery or apparatus for packing and compressing cotton, wool, and other substances.
804. Thomas Ellis, senr. of Tredegar Iron Works, in the county of Monmouthshire, engineer, for an improvement or improvements in constructing a metallic band or bands for raising and lowering heavy weights, and other like purposes.
805. Joseph Edwards, of King's College, London, Master of Arts, for an improved envelope, and the means of affording additional security to the same.
806. William Dray, of the firm of William Dray and Company, of Swan-lane, London, agricultural implement makers, for improvements in machinery for crushing, bruising, and pulverizing.
807. Charles Goty, of Rathbone-place, Oxford-street, Gent., for improvements in pumps for raising and forcing liquids.
808. George Wilson, of the York Glass Company, in the city of York, for an improved manufacture of glass bottles and jars.
809. William Green, of Islington, engineer, for improvements in the manufacture of textile fabrics, and in machinery or apparatus for effecting the same; parts of which improvements are also applicable to printing and embossing generally.

The above bear date November 20th.

810. Edwin Bates, of Great Portland-street, Portland-place, geometer, for the revolver, a perfect self-righting whale-fishing, pilot, or other boat, to be called "Bates's life boat." (No. 1 of a series of naval architecture.)
811. Benjamin Walker and William Bestwick, of Salford, braid manufacturers, for improvements in the manufacture of braid and the machinery or apparatus employed therein.
812. William Crosskill, of Beverley, ironfounder, for improvements in clod crushers, or rollers for rolling, crushing, or pressing land.
813. John Weems, of Johnstone, in the county of Renfrew, tinsmith, for improvements in obtaining motive power.
814. Robert Heggie, of Kircaldy, manufacturer, for improvements in railway brakes.
815. John Wheeley Lea, of the city of Worcester, chemist, and William Hunt, of Stoke Prior, manufacturing chemist, for improvements in the manufacture of iron.

816. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in the manufacture of paper.—being a communication.

817. John Pepper, junior, of Portsmouth, in the United States of America, for a new or improved machine for knitting ribbed work.

818. William Hedges, of Streatham-hill, for improvements in carriages.

819. James Roose, of Birmingham, for improvements in the manufacture of welded iron tubes.

820. Samuel Hunter, of Ravensworth-terrace, Gateshead, for improvements in anchors.

821. Joseph Blain, of Paris, for a new system of corking.

The above bear date November 22nd.

822. George Eade, of Stanhope-street, Hampstead-road, agent to Andrew Thorndike, of Cassel, Germany, for a surface-and-subaqueous-floating breakwater,—being the invention of the said Andrew Thorndike.

824. John Winter, of Bradford, engineer, for improvements in the mode of combining bars of iron so as to form larger masses or pieces of iron, applicable in the manufacture of axles, shafts, columns, beams, cannon, and other articles.

825. John Winter, of Bradford, engineer, for improvements in the manufacture of wheels.

826. Francis Bywater Frith, of Salford, manager, for certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, cords, beaverteens, and other similar fabrics, composed of cotton, silk, wool, and other fibrous materials.

827. John Kilner, of Thornhill-lees, near Dewsbury, glass bottle manufacturer, for certain improvements in the means of insulating the wires of electric telegraphs.

828. Michael Leopold Parnell, of Little Queen-street, Holborn, lock manufacturer, for an improvement in the construction of box staples and striking plates.

829. John Edwin Grisdale, of Bloomsbury-street, Holborn, for improvements in steering ships or vessels.

830. James Armitage of Bury, in the county of Huntingdon, machine maker, and Charles Thaxter, of Fenton, in the same county, brick maker, for improvements in dies for moulding plastic materials.

831. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in the construction of, and method of applying brakes to railroad carriages, engines, and tenders, for the purpose of preventing collisions,—being a communication.

832. John Beale, of East Greenwich, engineer, foran improved arrangement of steam-engine, and an improved packing to be used therein.

833. John Frearson, of Birmingham, for improvements in the manufacture of hooks for garments.
834. Charles Watt, of Brompton, for improvements in obtaining currents of electricity.
835. John Barker, of Richmond, physician, for improvements in separating gold from quartz or matters containing that metal.

The above bear date November 23rd.

836. William Oldham, of Southam, in the county of Warwick, farmer, for an improved dibble drill.
837. Augustus Turk Forder, of Leamington Priors, solicitor, for improvements in fenders for railway carriages.
838. James Carter, of Trump-street, London, manufacturer, for improvements in the manufacture of certain articles of dress or apparel.
839. James Higgin, of Manchester, manufacturing chemist, for improvements in the manufacture of certain mordants, used in preparing woven or textile fabrics, for printing, staining, or dyeing them; and in the mode or method of using the same or other mordants for the said purposes.
840. John Gedge, of Wellington-street, Strand, for an improved self-regulating artificial incubator,—being a communication.
841. Peter Armand le Comte de Fontainemoreau, of South-street, Finsbury, for improvements in machinery for manufacturing fishing and other nets,—being a communication.
842. Augustus Brackenbury, of Harmood-street, Camden Town, for making an electrifying machine of materials not hitherto used for such a purpose.
843. Henry Richards Caselli, of Deptford, block and mast maker, for improvements in the construction of anchors.
844. Richard Greenwood, of Sutton, in the county of York, for certain improvements in warming the upper rooms of houses.
845. John Richard Cochrane, of Glasgow, manufacturer, for improvements in the manufacture or production of ornamental or figured fabrics.
846. Joseph Henri Combres, of Paris, for preventing the ill effects of dampness in walls and dwellings,—being a communication.
847. Henry Thompson, of Clitheroe, in the county of Lancaster, calico printer, for inprovements in apparatus to be used in dyeing, bleaching, and other processes in which goods are operated upon in the piece.
848. Charles Finlayson, of Manchester, engineer, for improvements in apparatus for heating, drying and ventilating.
849. Achille Jean Louis Hypolite Tourteau Comte de Septeuil, of Paris, for improvements in the construction of electro-magnetic engines and in batteries.
850. William Henry Winchester, of Tamerton Foliott, near Plymouth, surgeon, for improvements in splints.

851. William Wilkinson, of Nottingham, framework knitter, for improvements in the manufacture of looped and textile fabrics, and in machinery for producing the same.

852. Alphonse Joly, of Paris, civil engineer, for certain improvements in steam-engines.

853. Stephen Spalding, of Hogsthorp, Lincolnshire, for an apparatus or machine for the manufacture of pantiles used in building purposes.

854. Edward Aitchison, Lieutenant in the Royal Navy, of Manor-street, Chelsea, and John Evans, of Hamilton-street, Wandsworth-road, boiler maker, for improvements in furnaces.

855. Robert Mortimer Glover, of Newcastle-upon-Tyne, M.D., for improvements in coating the bottoms and other parts of ships and vessels, in order to prevent animal and vegetable growth in contact therewith.

The above bear date November 24th.

856. Richard Dudgeon, of New York, machinist, for an invention for raising heavy weights, by means of a portable hydraulic press.

858. John Tatham and David Cheetham, of Rochdale, machine makers, for improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous substances.

859. Thomas Bennett, of West Bromwich, for improvements in heating air for blast furnaces.

860. William Hall, of Nottingham, cabinet maker, for improvements in rotary steam-engines, governors, and apparatus for supplying boilers with water, and for regulating the same.

861. James Murdoch, of Staple Inn, for an improved machine for shaping staves for casks, vats, and other similar vessels,—being a communication.

862. Andrew Jeffrey, of Chirnside, in the county of Berwick, blacksmith, for improvements in reaping machines.

863. Henry Holland, of Birmingham, umbrella manufacturer, for improvements in the manufacture of umbrellas and parasols.

864. Maximilian François Joseph Delfosse, of Moorgate-street, Gent., for improvements in preserving wood, stuffs, and other fabrics, and in rendering them uninflammable,—being a communication.

865. Charles Harford, of Down Place, near Windsor, Esq., for improvements in rotary engines.

866. James Robertson, of Glasgow, cooper, for improvements in furnaces or fireplaces.

867. Charles Iles, of Birmingham, for improvements in the manufacture of chimney pieces.

The above bear date November 25th.

868. Amédée François Rémond, of Birmingham, for a new or or improved lock,—being a communication.

869. Adam Ogden, of Huddersfield, machine maker, and John Ogden, of Hey Chapel, Ashton-under-Lyne, manager, for improvements in machinery for spinning cotton or wool.

870. James Ward Hoby, of Renfrew, engineer, and John Kinniburgh, of Renfrew, foundry manager, for improvements in the manufacture of metal castings.

871. James Taylor, of Britannia Works, Birkenhead, for certain improvements in and applicable to floating graving docks for repairing and building ships.

872. Auguste Edward Loradoux Bellford, of Castle-street, Holborn, for improvements in the manufacture of bricks,—being a communication.

873. Charles Claude Glover, of Paris, for a system of stoppering instantaneously bottles and other vessels used for containing aerated liquids.

874. Paul Sormani, of Paris, for an improved travelling case.

875. Armand Jean Constantin Hudault, of Paris, for an improved leaven.

877. Thomas Ainsley Cook, of Wall's End, manufacturing chemist, for improvements in bleaching.

878. Thomas Charles Medwin, of Blackfriars-road, engineers, for improvements in water-gauges, or instruments for indicating the height of water in boilers.

879. Jean Ambroise Oudart, of Paris, engineer, for improvements in presses for obtaining copies of letters, and other like purposes.

880. Alexander Turiff, of the New Town Foundry, Paisley, for improvements in moulding or shaping metals.

881. Henry Bollman Condy, of Battersea, for improvements in the manufacture of acetic acid and acetates.

882. Antonio Fedele Cossus, of University-street, for improvements in lubricating apparatus.

883. William Massingham, of Ipswich, for improvements in carriages and apparatus for carrying the dead.

884. Robert Barnard Feather, of Liverpool, merchant, for improvements in the construction of ships, and in rendering ships and boats impervious to shot.

885. George Augustus Huddart, of Brynkir, in the county of Caernarvon, Esq., for certain improvements in tools for cutting or abrading metallic and other surfaces.

886. Edwin Lewis Brundage, of Jewin-crescent, Gent., for improvements in apparatus for drawing off fluids from animal bodies,—being a communication.

887. Thomas Wood, of the Glue Works, Hunslet, millwright, for improvements in the mode of obtaining motive power.

888. George Augustus Huddart, of Brynkir, Esq., for improvements in facilitating combustion in steam-boiler furnaces.

889. George Augustus Huddart, of Brynkir, Esq., for an improved manufacture of artificial flies.

890. Mathurin Jean Prudent Moriceau, of Paris, engineer, for improvements in sharpening and dressing the cards of carding machines, and the clippers and cylinders of shearing machines.

891. Harry Winton, of Dove Mills, Cleveland-street, Birmingham, manufacturer, and Francis Parkes, of Sutton, Coldfield-park, in the county of Warwick, manufacturer, for improvements in the manufacture of agricultural and horticultural forks, and pronged or toothed instruments and hoes.

The above bear date November 26th.

893. John Lotsky, of Soho-square, Doctor of Philosophy, for improved playthings, hereby denominated "Pestalozzian gymnastic playthings."

894. William Joseph Curtis, of Grafton-place, Euston-square, civil engineer, for certain improvements in the formation of tramroads or railroads, and carriages that run thereon.

895. Emile Martin, of Paris, chemist, for certain improvements in the mode of extracting gluten from wheat, and for preparing and drying the same by mixing to several degrees of concentration.

896. John Gilmore, Lieutenant in the Royal Navy, of George-yard, Lombard-street, for an improved mode or means of extinguishing fire in ships or other vessels.

897. George Houghton, of Birmingham, for improvements in the manufacture of College caps.

898. William Edward Schottlander, of Southwark, Gent., for improvements in machinery for boring the ground, stone, or rocks, for the formation of drains and sewers, for the laying of pipes underground, and for removing obstructions therein; also in the manufacture of pipes to be used in connection with such machinery; and in instruments for surveying and levelling preparatory to the boring operations,—being a communication from Emil Schott, of Brunswick.

The above bear date November 27th.

899. Frederick Westbrook, of Kensington, Gent., for improvements in clasps for books.

900. Samuel Cunliffe Lister, of Manningham, in the county of York, manufacturer, and James Warburton, of Addingham, in the same county, worsted spinner, for improvements in the manufacture of yarn from fibrous materials.

901. Thomas Dudgeon, of Edinburgh, Gent., for improvements in hydrostatic propulsion.

902. William Fowler and William Mc Collin, of Kingston-upon-Hull, agricultural implement makers, for a machine constructed and adapted for a clod-crusher and land-cultivator.

903. William Pink, of Fareham, in the county of Hants, saddler, for an improved construction of stirrup-bar for saddles.

904. Eugène Nicolle, of Birmingham, civil engineer, for improvements in apparatus for damping, cutting, and attaching stamps and labels.

905. Matthew Samuel Kendrick, of Birmingham, for improvements in grates and fire-places.
906. Matthew Samuel Kendrick, of Birmingham, for improvements in lamps and burners, and in the apparatus to be used therewith.
907. Jean David Schneiter, of Paris, for improvements in maps and charts.
908. Francis William Ellington, of Drummond-street, Euston-square, for improvements in the making of screws for collapsible and other vessels.
909. William Brown, of Airdie, in the county of Lanark, electrician, for improvements in electric-telegraph instruments.

The above bear date November 29th.

911. John Addison, Captain in the service of the Hón. East India Company, of Baker-street, Portman-square, for the invention of ascertaining the hour of the day by means of a pocket sun-dial.
912. William Jeffs, of Hulme, near Manchester, painter, for improvements in manufacturing letters, figures, and ornamental work, and in the mode of attaching the same to wood, stone, iron, and certain other materials.
913. James Murdoch, of Staple Inn, for certain improved materials for use in painting,—being a communication.
914. James Mayelston Haldon, of Lime-street, London, Esq., for certain improvements in the means of rendering wood imperishable and uninflammable,—being a communication.
915. Samuel Clark, of Albany-street, Regent's-park, lamp manufacturer, for improvements in lamps.
916. Allan Craig, of Barhead, near Glasgow, builder, for an improved crane and apparatus connected therewith.
917. John Brannis Birch and Eugenius Birch, both of Cannon-row, Parliament-street, civil engineers, for improvements in forming drains, and introducing pipes or tubes into the earth.
918. Joseph Skertchley, jun., of Anstey, near Leicester, engineer, for improvements in mangles and mangle-rollers.
919. To James Barlow, of King William-street, ironmonger, for improvements in stands or supports for casks, barrels, and other like vessels.
920. Thomas Parramore, of Southwark, waterproofer, and Samuel Lewis, of Stepney, tailor, for improvements in articles of wearing apparel.
921. George Fitt, of Chalk, near Gravesend, for the invention of obtaining mechanical motive power and speed.

The above bear date November 30th.

923. Charles Hart, of Wantage, Berkshire, agricultural implement manufacturer, for a thrashing, straw-shaking, riddling, and winnowing machine combined.
924. William Slater, of Carlisle, for improvements in ovens and apparatus for baking.
925. George Augustus Huddart, of Brynkir, in the county of

Caernarvon, Esq., for improvements in the construction of boilers and furnaces for generating steam.

926. Charles Walker, of Heap Bridge, near Bury, engineer, for improvements in the method of purifying water for steam-boilers and other purposes.

927. Robert Milligan, of Harden Mills, Bingley, in the county of York, for improvements applicable to combing machinery.

928. William Morris, of Westminster, civil engineer, for improvements in the production of motive power, and in apparatus pertaining thereto.

929. Frederick William Green, of Bristol and London, Esq., ship owner, for certain improvements in the mode of propelling ships and other vessels.

The above bear date December 1st.

930. John Dable, of Birmingham, carpenter, and William Wells, of Birmingham, carpenter, for an improvement in rolling metals.

931. Robert Kirke, of Llanelly Dock, Llanelly, colliery agent, for an improved grate or apparatus for burning fuel, especially adapted for anthracite coal, whether used under reverberatory furnaces or boilers, or with or without a blast.

932. William Taylor, of Oxford-terrace, Hyde Park, for improvements in propelling ships and other floating bodies.

933. James Rothwell, of Heywood, near Manchester, manager, for certain improvements in looms for weaving.

934. William Keld Whytehead, of Cornhill, consulting engineer, for certain improvements in steam-engines and steam-boilers.

935. James Edward Mc Connell, of Wolverton, civil engineer, for improvements in locomotive engines.

936. John Norton, of Cork, Esq., for improvements in shot or projectiles.

937. Ebenezer Poulson, of Monkwearmouth, for an improved mechanical purchase, applicable to working ships' and other pumps, and to similar purposes.

938. Charles Millar, of Dundee, brewer, for improvements in in time-keepers or clock-work, and in machinery or apparatus worked in connexion therewith.

The above bear date December 2nd.

939. James Newall, of Bury, railway carriage builder, for improvements in breaks, machinery, or apparatus applied to railway and other carriages in motion, and in the mode or method of connecting two or more of such breaks together.

940. Noble Seward, of Caherconlish, in the county of Limerick, Gent., for improvements in applying hydro-pneumatic agency for obtaining motive power.

941. Thomas Collins Banfield, of Queen's-square, Westminster, Gent., for improvements in the process of and apparatus for extracting saccharine and other juices from beet root or other roots and plants,—being a communication.

942, Peter Walker, and Andrew Barclay Walker, of King-street,

Warrington, brewers, for improvements in fermenting ale and porter and other liquids.

943. Henry Hitchins, of King William-street, and William Batley, of Denmark-street, Bloomsbury, for improvements in producing raised surfaces and imitations of carvings from materials not hitherto similarly applied.

944. Page Dewing Woodcock, of Lincoln, chemist, for an improved preparation or pill for medicinal purposes, hereby denominated "Page Woodcock's wind pills."

945. Cornelius de Bergue, of Manchester, engineer, for improvements in, and applicable to, looms for weaving,—being a communication.

946. George Ware, of Sydenham, cordwainer, and Albert Henry Fernandez, civil engineer, of Newington-crescent, for improvements in the making of wedges or keys for holding or tightening the rails within railway chairs.

947, John Neale, of High-street, Ordnance-place, Chatham, lath render, for improvements in back fastenings for Venetian and other swing shutters or blinds, and also for swing windows and doors.

948. George Stiff, of Christchurch-road, Brixton-hill, Gent., for an impoved construction of printing machine.

949. John Bethell, of Parliament-street, Gent., for improvements in machinery or apparatus for digging and cultivating land.

950. John Bethell, of Parliament-street, Gent., for improvements in steam-engines.

951. Arthur Wall, of the East India-road, for improvements in preparing sheet metal for ship building and other uses.

952. Duncan McNee, of Kirkintulloch, in the county of Dumbarton, calico printer, for a machine for printing with colors on cloth, and which is also applicable for printing ornamental designs on paper.

953. Richard Archibald Brooman, of Fleet-street, for improvements in the manufacture of sugar,—being a communication.

954. Samuel Neville, of Gateshead, glass manufacturer, for improvements in the manufacture of lamp glasses and globes.

955. William Keates, of Liverpool, merchant, for improvements in fire-boxes for locomotive and other steam-boilers.

The above bear date December 3rd.

956. John Thornborrow Manifold and Charles Spencer Lowndes, of Liverpool, engineers, for improvements in the method of extracting the juice from the sugar cane.

957. John Rowbotham, of Manchester, merchant, for improvements in time keepers and apparatus connected therewith, for ascertaining the attendance on duty of watchmen and other persons having charge of property,—being a communication.

958. Alexander Lawrie, chief engineer of Her Majesty's Dockyard, Chatham, for improvements in the manufacture of oars and similar articles.

959. James Murdoch, of Staple Inn, for an improved galvanic battery,—being a communication.
960. Joseph Bentley of Liverpool, gun manufacturer, for improvements applicable to fire-arms.
961. Joseph Cliff, of Wortley, in the parish of Leeds, fire-brick manufacturer, for improvements in the mode of making and compressing bricks, lumps, tiles, quarries, terra-cotta, and other similar articles.
962. William Maugham, of Ifield-terrace, in the county of Surrey, for improvements in rendering wood fireproof.
963. George Frederick Parratt, of Piccadilly, for improvements in portable bridges or pontoons.
964. Isaac Lewis Pulvermacher, of Paris, engineer, for improvements in pipes and cigar-holders.

The above bear date December 4th.

965. Denis John Murphy, of Cork, Gent., for an improved agricultural machine, which he calls the "Archimedean agricultural machine."
966. James Buchanan, of Glasgow, manufacturer, for improvements in the treatment of flax, and other similar vegetable fibrous substances, and in the machinery employed therein.
967. Richard Archibald Brooman, of Fleet-street, for improvements in saws and saw mills,—being a communication.
968. Guillaume Ferdinand de Douhet, of Paris, for improvements in the manufacture of alcoholic, saccharine, and starch products.
969. André Jacques Amand Gautier, of Paris, for an improved treatment of peat.
970. Asa Lees, of Rhodes-house, Oldham, machine maker, and Thomas Kay, of Mumps, Oldham, machine maker, for improvements in machinery for spinning and doubling cotton, wool, silk, flax, and other fibrous materials.
971. Frederick Mackellar Gooch, of Bolton le-Moors, engineer, for improvements in the construction of railway signals, and in machinery or apparatus for working railway signals.
972. Charles Alfred Jordery, of Paris, manufacturer, for improvements in the construction of the bodies of cravat collars, and stocks and stiffeners, and in the ornamenting of cravat collars and stocks in general.
973. Richard Laming, of Millwall, chemist, for improvements in purifying gas, and in obtaining from the products resulting from the purification of gas certain useful compounds.
974. Edward Tucker, of Belfast, for improvements in the manufacture or production of starch.
975. William Paton, of Johnstone, North Britain, manufacturer, for improvements in the manufacture of driving-bands for machinery.
976. John Norman, of Liverpool, shipowner, for improvements in the mode of making and setting the square sails of ships or vessels of any size and description.

977. William Blackett, of Blackfriars-road, for improvements in steam-boilers.

978. James Smith, of Little Canterbury-place, Lambeth-walk, for improvements in paving roads and other surfaces.

980. Thomas Conolly, of Hanover-square, Esq., M.P., and William Cotter, of Beeston, Nottingham, engineer, for improvements in propelling vessels.

The above bear date December 6th.

981. Pierre Duchamp, of Lyons, machinist, for an improved Jacquard machine.

982. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for improvements in constructing the bars of furnaces and grates,—being a communication.

983. John Henry Johnson, of Lincoln's-Inn-Fields, Gent., for improvements in weaving carpets and other fabrics, and in the machinery or apparatus employed therein,—being a communication.

984. Thomas Challinor, of Bolt-court, Fleet-street. for improvements in apparatus to be applied to decanters and other bottles to facilitate the running off liquids therefrom.

985. William Mayo, of Berners-street, for improvements in balls or float-valves and cocks.

986. James Norton, of Ludgate-hill, Gent., for an improved mode of transmitting motive power.

987. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for an improved mode of transportation for the conveyance of letters, packages, freight, or passengers, from one place to another,—being a communication.

988. Samuel Aspinwall Goddard, of Birmingham, merchant, for improvements in the construction of pistols.

989. Richard Archibald Brooman, of Fleet-street, for improvements in safety valves,—being a communication.

990. Richard Archibald Brooman, of Fleet-street, for improvements in machinery or apparatus for heating, evaporating, torrefying, distilling, and refrigerating,—being a communication.

The above bear date December 7th.

New Patents

SEALED IN ENGLAND.

1852.

To Pierre Jules Lamaille, of Paris, in the Republic of France, manufacturer, for certain improvements in the preservation of japanned leather.—Sealed 1st December.

William Gorman, of Glasgow, in the county of Lanark, North Britain, engineer, for improvements in obtaining motive power, which improvements or parts thereof are applicable for measuring and transmitting aeriform bodies and fluids.—Sealed 8th December.

William Hodgson, of Skircoat, in the county of York, engineer, for improvements in the manufacture of woven, textile, and looped fabrics, aud in the machinery employed therein. Dated 30th September, 1852.—6 months for inrolment. [This patent, being opposed at the Great Seal, was not sealed till the 15th December, 1852, but bears date the 30th September, 1852, by order of the Lord Chancellor.]

George Shaw, of Birmingham, in the county of Warwick, patent agent, for certain improved machinery for making envelopes and bags,—being a communication.—Sealed 17th December.

Robert Burn, of Edinburgh, Scotland, practical engineer, for a certain improvement in steam-engines.—Sealed 21st December.

Robert Galloway, of Cartmel, in the county of Lancaster, for improvements in the manufacturing and refining of sugar.—Sealed 21st December.

Patents sealed under Patent Law Amendment Act, 1852.

51. Thomas Craddock, of the Ranelagh Works, Thames-bank, engineer, for certain improvements in the steam-engine and the steam-boiler.—October 1.

70. Robert Lakin, of Ardwick, in the county of Lancaster, machinist, and William Henry Rhodes, of Gorton, in the said county, mechanic, for improvements in machines for spinning and doubling cotton and other fibrous substances.—October 1.

77. Stephen Soulby, of Ulverston, printer, for improvements in machinery for letter-press printing.—October 1.

78. William Smith, of Kettering, agricultural implement maker, for improvements in machinery or apparatus for cleaning currants, raisins, and other fruits or vegetable substances.—October 1.

79. Henry Smith, of Stamford, agricultural implement maker, for improvements in reaping machines.—October 1.

80. Matthias Walker, of Horsham, ironmonger, for an improved ash-pan, or apparatus for taking up ashes and cinders, and separating or sifting them.—October 1.

81. Frederick Osbourn, of Albion-street, King's-cross, tailor, for a machine or apparatus for facilitating the manufacture of various kinds of garments or wearing apparel.—October 1.

88. George Holcroft, of Manchester, engineer, for certain improvements in steam-engines.—October 1.

95. William Oxley, of Manchester, merchant, for improvements in apparatus for heating and drying.—October 1.

96. Henry Bridson, of Bolton-le-Moors, bleacher, for improvements in machinery to facilitate the rinsing, washing, and cleansing of fabrics; which machinery is also applicable to certain operations in bleaching and dyeing.—October 1.
97. John Macmillan Dunlop, of Manchester, engineer, for improvements in the manufacture of wheels for carriages.—October 1.
103. Charles Lungley, of Poplar, ship-builder, for improvements in ship-building.—October 1.
108. Thomas Fearn, of Birmingham, electro-metallurgist, for certain improvements in ornamenting metallic surfaces, and in machinery and apparatus to be employed therein.—October 1.
112. Hermann Turck, of Broad-street-buildings, London, merchant, for improvements in packing goods.—October 1.
115. Charles John Carr, of Belper, in the county of Derby, engineer, for improvements in machinery for making bricks and other similar articles.—October 1.
117. John Wilson Fell, of Glasgow, rope and sail maker, for improvements in preparing and spinning hemp and other fibrous materials, for the purpose of making ropes, twines, and other similar articles.—October 1.
128. William Rogers, of Long-acre, for improvements in studs, buttons, and other fasteners.—October 1.
150. Thomas Boyd, of Glasgow, calico printer, for improvements in the treatment or finishing of woven fabrics.—October 2.
151. David Wilkinson Sharp, of Bingley, in the county of York, manufacturer, for improvements in machinery for combing and drawing a sliver of wool, flax, silk-waste, and other fibrous substances; and in apparatus for constructing screws to be used in a part or parts of such machinery.—October 2.
174. Alexander Campbell Duncan, of Glasgow, calico printer, for improvements in the art or process of dyeing cotton or other textile fabrics, or cotton or other yarns, when printed or mordanted with the coloring matter of madder or of dyewoods, and in machinery or apparatus employed therein.—October 2.
187. Alexander Miller, of Glasgow, for improvements in the treatment or finish of textile fabrics and materials.—October 2.
188. John Weems, of Johnstone, in the county of Renfrew, tinsmith, for improvements in obtaining and applying motive power.—October 2.
190. James Anderson Young, of Buchanan-street, Glasgow, dentist, for certain improvements in dental operations, and in apparatus or instruments to be used therein.—October 2.
193. Ralph Errington Ridley, of Hexham, in the county of Northumberland, tanner, for improvements in cutting and reaping machines.—October 2.
214. Thomas Kennedy, of Kilmarnock, gun manufacturer, for improvements in obtaining and applying motive power; which improvements, or parts thereof, are applicable to time-keepers

and clock-work, and for measuring and registering the flow of water and other fluids, and aeriform bodies.—October 4.

215. John Erskine, of Greenock, felt manufacturer, for improvements in the manufacture of felted and cemented fabrics.—October 4.

237. Herm Jäger, of Ludgate-hill, merchant, for improvements in the treatment of cotton and other similar fabrics, by the introduction of chemical agents, to supersede the use of dung in the dunging process.—October 5.

255. John Crook, packer, and John Wilkinson Wood, manager, both of Manchester, for certain improvements in the method of preserving hoop-iron from oxidation or decay.—October 6.

279. James Clark, of Chapel House, Paisley, Esq., for improvements in weaving carpets and other fabrics, and in the machinery or apparatus employed therein.—October 6.

285. Edwin Pettit, of Kingsland, civil engineer, and James Forsyth, of Calbeck, Cumberland, spinner, for improvements in spinning and drawing cotton and other fibrous substances, and in machinery for that purpose.—October 7.

290. William Horsfield, of Swillington Mills, near Leeds, miller, for improvements in splitting, crushing, and grinding corn, seeds, grain, minerals, or other substances.—October 7.

294. Mitchel Thomson, of Plymouth, surgeon, for improvements in lamps, and in the production of artificial light.—October 7.

304. John Paterson, of Wood-street, London, manufacturer, for improvements in buckles or fastenings.—October 8.

309. James Yule, of St. Luke's terrace, Gloucester, mechanician, for an improved arrangement of sawing machinery.—October 8.

314. Richard Husband, of Manchester, hat manufacturer, for certain improvements in weaving hat-plush and other textile fabrics.—October 9.

325. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in composing and distributing type.—October 9.

331. David Laidlaw, of Glasgow, brass-founder, for improvements in the manufacture or production of gas-burners.—October 11.

360. George Lloyd, of the parish of Budbrooke, in the county of Warwick, Doctor of Medicine, for an improvement or improvements in the manufacture of paper.—October 13.

364. Matthew Smith, of Over Darwen, manager, for improvements in machinery for weaving and printing.—October 13.

365. Edward Lloyd, of Dee Valley, near Corwen, Merionethshire, engineer, for certain improvements in steam-engines; the whole or part of which improvements are applicable to other motive engines.—October 13.

367. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for a certain chemical combination for the silicatisation of calcareous matters.—October 13.

369. Thomas Suttie, of Greenock, smith, for improvements in roasting apparatus.—October 13.

370. Robert Pinkney, of Long-acre, ink manufacturer, for improvements in cases for holding marking materials.—October 13.
380. Alfred Augustus De Reginald Hely, of Cannon-row, Westminster, civil engineer, for an improved waiter or tray.—October 14.
398. Hermann Turck, of Broad-street-buildings, London, merchant, for improvements in propelling vessels.—October 15.
404. William Stevenson, of Preston, in the county of Lancaster, for improvements in weft-forks for power-looms.—October 15.
407. Charles Henry Waring, of Neath Abbey, in the county of Glamorgan, iron-master, for improvements in the cutting and working or quarrying of coal, stone, shale, clay, and other similar substances, and in machinery for that purpose.—October 15.
409. Evan Leigh, of Manchester, cotton-spinner, for certain improvements in machinery or apparatus for carding cotton and other fibrous materials.—October 16.
423. Samuel Fletcher Cottam, of Manchester, machinist, for improvements in quarrying slate.—October 18.
425. George William Lenox, of Billiter-square, chain-cable manufacturer, and William Roberts, of Millwall, Poplar, for improvements in machinery for raising and lower cables and other chains.—October 18.
426. William Roberts, of Millwall, Poplar, for improvements in machinery for stopping and lowering cables and other chains.—October 18.
428. John Campbell, of Bowfield, in the county of Renfrew, bleacher, for improvements in the treatment or finishing of textile fabrics and materials.—October 18.
463. William Harrison, of Blackburn, machinist, for certain improvements in machinery or apparatus for sizing and otherwise preparing cotton, wool, flax, and other warps for weaving.—October 20.
475. John Currie, of Glasgow, miller, for improvements in grinding wheat and other substances; and in the treatment and preparation of such substances and the products thereof.—October 21:
502. Charles William Graham, of Bishopsgate-street Within, merchant, for improvements in the manufacture of bottles and jars.—October 23.
540. Thomas Potts, of Birmingham, tube-maker, for improvements in the manufacture of hinges, and in the machinery for producing the same.—October 27.
550. John Wormald, of Manchester, packer, for improvements in machinery or apparatus for roving, spinning, and doubling cotton, wool, or other fibrous substances.—October 28.
603. David Thomson, of Dundee, manufacturer, for improvements in the manufacture of carpets.—November 1.

[*These patents do not extend to the colonies.*]

CELESTIAL PHENOMENA FOR JANUARY, 1858.

D.	H.	M.	
1			Clock before the ☉ 3m. 59s.
—			☽ rises 10h. 57m. A.
—			☽ passes mer. 4h. 44m. A.
—			☽ sets Morn. M.
—			Occul. c, Virginis, im. 13h. 5m. em. 13h. 22m.
2	9	54	☽ in □ or last quarter
3	21	48	♀ in conj. with ♃ diff. of dec. 0. 46. N.
4	7	10	♃'s third sat. will im.
5			Clock before the ☉ 5m. 49s.
—			☽ rises 3h. 0m. M.
—			☽ pass mer. 8h. 3m. M.
—			☽ sets 0h. 55m. A.
6	6	0	☽ in Perigee
6	15	9	♃ in conj. with the ☽ diff. of dec. 0. 50. S.
	20	16	♀ in conj. with the ☽ diff. of dec. 0. 6. N.
7	9	56	☿ in conj with the ☽ diff. of dec. 1. 37. N.
9	3	53	Ecliptic conj. or ● new moon
	10	44	♂ in conj. with the ☽ diff. of dec. 1. 18. N.
10			Clock before the ☉ 7m. 57s.
—			☽ rises 9h. 1m. M.
—			☽ pass mer. 0h. 59m. A.
—			☽ sets 5h. 0m. A.
10	8	33	☿ greatest elong. 23. 33. W.
12	4	0	♅ stationary.
	15	0	♄ stationary.
14			Occul. 30, Piscium, im. 6h. 19m. em 7h. 31m.
—			Occul. 33, Piscium, im. 4h. 24m. em. 5h. 5m.
15			Clock before the ☉ 9m. 50s.
—			☽ rises 11h. 5m. M.
—			☽ pass mer. 5h. 0m. A.
—			☽ sets 11h. 8m. A.
	5	13	♃'s first sat. will im.
17	5	29	☽ in □ or first quarter
	5	45	♅ in conj. with the ☽ diff. of dec. 4. 5. N.
	20	44	♄ in conj. with the ☽ diff. of dec. 1. 38. N.
—			Mercury, R. A., 18h. 20m. dec. 22. 50. S.
17			Venus, R. A., 17h. 54m. dec. 22. 39. S.
—			Mars, R. A., 20h. 7m. dec. 21. 16. S.
—			Vesta, R. A., 2h. 24m. dec. 8. 13. N.
—			Juno, R. A., 1h. 8m. dec. 4. 9. S.
—			Pallas, R. A., 14h. 12m. dec. 2. 19. S.
—			Ceres, R. A., 14h. 29m. dec. 4. 18. S.
—			Jupiter, R. A., 16h. 56m. dec. 22. 2. S.
—			Saturn, R. A., 2h. 37m. dec. 12. 55. N.
—			Uranus, R. A., 2h. 9m. dec. 12. 36. N.
—			Mercury pass mer. 22h. 34m.
—			Venus pass mer. 22h. 8m.
—			Mars pass mer. 0h. 20m.
—			Jupiter pass mer. 21h. 6m.
—			Saturn pass mer. 6h. 49m.
—			Uranus pass mer. 6h. 21m.
18			☽ in Apogee
19	7	26	♃'s second. sat. will im.
20			Clock before the ☉ 11m. 26s.
—			☽ rises 0h. 38m. A.
—			☽ pass mer. 8h. 35m. A.
—			☽ sets 3h. 38m. M.
	19	17	☿ in the descending node.
21			Occul. o Tauri, im. 3h. 29m. em. 4h. 19m.
22	7	7	♃'s first sat. will im.
22	10	30	Pallas in □ with the ☉
24	2	12	♅ in □ with the ☉
25			Clock before the ☉ 12m. 43s.
—			☽ rises 4h. 49m. A.
—			☽ pass mer. 0h 4m. M.
—			☽ sets 8h. 19m. M.
	5	43	Ecliptic oppo. or ○ full moon
26	6	33	♂ in conj. with the ☉
28			Vesta in conj. with B.A.C. 845
	5	30	Vesta in □ with the ☉
	22	58	Ceres in □ with the ☉
30	18	15	♄ in □ with the ☉
	23	10	☿ in Aphelion.

J. LEWTHWAITE Rotherhithe.

THE

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RECENT PATENTS.

To William Smith, *formerly of* 90, *Park-street, Grosvenor-square, but now of* 10, *Salisbury-street, Adelphi, civil engineer, and* Archibald Smith, *of Princes-street, Leicester-square, engineer and machinist, for certain improvements in electric and electro-magnetic telegraphic apparatus, and in the machinery for, and method of, making and laying down submarine, submerged, and other such lines.*—[Sealed 8th March, 1852.]

This invention consists, firstly, in an improved method of insulating circuit-wires from the posts or other supports used for suspending the same; and, secondly, in certain arrangements of machinery applicable to the manufacture of cables for the transmission of electric currents from one place to another, and also to the "paying out" or laying down of such cables as they are manufactured, when they are used as submarine electric conductors.

In Plate III., fig. 1, represents a wooden post, supporting four lines of telegraph wire; and fig. 2, is a horizontal section thereof. Attached to the post *a*, are four boxes *b, b,* made of glazed earthenware or other non-conducting material, and intended severally to receive and retain the ends of two galvanized iron wires *c, c*. Each box is provided with a cover *d*, and has sufficient internal capacity to contain a small glazed earthenware "dead-eye" or insulator, of the form represented in external view and section at fig. 3. To this dead-eye are attached the short pieces of galvanized iron wire *c, c,* which pass out at the ends of the box, right and left, as shewn. When

these wires are thus attached, the hollow in the box is filled with a suitable cement, over which the lid is placed, and thus all risk of rain or moisture getting to the wires, and forming a conducting surface, is prevented. The other end of each of the short pieces of galvanized wire is attached to a similar dead-eye or insulator to that shewn at fig. 3, as close to the box as may be found convenient. To these external dead-eyes or insulators *e*, (figs. 1, and 2,) are attached the lengths of galvanized iron wire *g, g,* extending to the next adjoining post or point of suspension. In this way the lines of telegraph wire are secured and fixed at each post from end to end. The dead-eyes or insulators may be made of well-glazed earthenware, or of glass, or other non-conducting material. The ends of the wires are severally twisted into an eye or loop around the dead-eye, and at a right angle to each other. It will thus be seen that the means of breaking the continuity of the telegraph line is three times repeated at each post.

In order to restore the circuit, and at the same time prevent the possibility of the electric current being conducted to the earth through the posts or other points of suspension, the patentees adopt the following means:—A stout copper rod, or a strip of sheet-copper *f*, (figs. 1, and 2,) is attached to the wires *g, g,* and bowed or bent so as to pass across the post without touching it. Care must be taken that this copper connecting piece is sufficiently stiff to maintain its form and position, and that perfect contact is made between it and the wires *g, g*. By this means, the continuity which had been broken throughout the line of telegraph, by interposing the non-conducting surfaces, will be re-established, and the current may pass freely along the entire length.

Fig. 4, shews a modification of the mode of carrying out the same principle of breaking the continuity,—the intention being to supersede the use of the dead-eye, which has been described as enclosed in the box. Instead thereof, volute grooves are sunk in the face of the box which is to receive the ends of the wires. These wires, having been previously bent to a corresponding figure, are placed in the grooves; and the cover is put on with proper luting or cement, and affixed to the box by screws. The external dead-eyes or insulators are the same as before described. The form of the grooves that receive and retain the wires may be somewhat varied.

Fig. 5, is an internal view and fig. 6, a horizontal section of another arrangement for effecting the same object. A strong stud *h*, projecting from the face of the box, receives the looped ends of the wires, between which an insulating

washer *i*, is interposed. The space between the box and its cover is filled with cement or composition, and the cover is secured by pins.

Fig. 7, is a horizontal section of a post fitted with common insulators. In this instance, the connecting piece of wire, between the main lines of galvanized wire, is in one length instead of two, as before described, and merely passes through and rests on the insulator. The continuity in this arrangement is broken in two places only; and the circuit is re-established by means of the connecting piece, as before explained.

Figs. 8, 9, and 10, exhibit an improved arrangement of machinery and apparatus for protecting insulated telegraph wires, by forming a metallic cable around them, and submerging the same as it is delivered out of the twisting machine. Fig. 8, is a longitudinal section of a steam vessel, fitted with the machinery for twisting several wires or strands around a core of insulated wires. The machinery shewn is adapted for combining ten strands; but it will be obvious that the same principle of construction may be used for combining a greater or less number of strands.

As the like construction of mechanism is used for giving off and twisting each wire or strand, it will only be necessary to describe one such arrangement, and shew its connection with the adjoining parts. Fig. 9, is a side elevation of a frame and its appurtenances for carrying a reel or bobbin of covering wire; and fig. 10, is a cross section of the same. *a, a,* are the main frames, from each of which a series of studs, equidistant from a common centre, project, to form the axles for a series of grooved antifriction-rollers *b*. Each set of these rollers carries a wheel *c*; and these wheels *c*, are severally connected, by cross-rods *d*, to a cog-wheel *c**, which is bolted to the next adjoining wheel *c*. This combination of the wheels *c*, and *c**, forms a series of skeleton-drums throughout the whole length of the machine, which drums are caused to rotate simultaneously, as will be presently explained. Within each drum, thus formed, a reel *f*, for carrying the covering wire or strand, is mounted,—such reel being supported therein by a frame *e*, which is itself carried by means of trunnions, projecting therefrom, and having their bearing at the centre of the wheels *c*, and *c**. Friction-straps, connected to the frame *e*, pass over the ends of each reel, to prevent it from turning too readily on its axis; but, at the same time, it will revolve, by reason of the drag put upon the wire, and thereby allow of the wire being unwound. One of the trunnions of the

frame *e*, is made hollow, to receive the wire from the reel and guide it in its course. It thence passes between the arms of the adjacent cog-wheel *c**, and is carried over an antifriction-roller *g*, supported by one of the cross-rods *d*. The wire then enters a hole in the rim of the wheel *c*, and passes through it and through a series of holes, concentric therewith, in the several wheels *c*, and *c**, which intercept the wire or strand on its passage to the hollow cone that gathers up the several wires ready to be drawn together and laid around the core of insulated wires by the laying and tube-plates.

Rotation is given to the machinery by means of a series of pinions *h*, which are keyed on the main driving-shaft *i*, and take into and drive the wheels *c**. The wires or strands are thus carried round in a circle, as they are unwound from their respective reels; and they are thereby "laid," in the manner of strands of rope. During this operation, the frames, which carry the respective reels, will remain quiescent,—a weight *j*, being attached thereto, to overcome all friction of contact between the trunnions and the wheels that support them; and the reels *f*, *f*, will have merely an axial motion. If, however, it is thought desirable to give the wires an independent twist, this may be readily accomplished by affixing to each frame *a*, *a*, a ring *k*, (see fig. 9,) furnished with rack-teeth on its inner periphery, and mounting on the several wheels *c*, a pinion *l*, in gear therewith. The rotation of the wheels *c*, will cause the pinions *l*, to rotate; and this motion may be taken from the stud of the pinion *l*, by means of a pulley and strap *m*, and conveyed to a pulley *n*, keyed to the hollow trunnion of the frame *e*, (as shewn at fig. 10,): by which means a slow rotary motion will be imparted to the frame. It should be remarked that the several wheels *c*, *c*, and *c**, *c**, must be pierced with holes, (as shewn in the side view, fig. 9,) to allow of the protecting wires passing through them; and concentric holes must be made throughout the series, to admit of the passage through them of the insulated wires, which are coiled round the reel *o*, (fig. 8,) and are intended to form the core of the cable.

In order to operate with this machine, a given length of insulated wires must be first prepared and wound upon reels or bobbins. A reel of this wire is mounted on a frame, as shewn at *o*, fig. 8; and the wire is threaded, first through a central guide-plate, then through the twisting-machine, and it ultimately passes out through the laying-plate *p*, and the tube or nipper *s*. The protecting wires or strands are also, in like manner, supplied in a given quantity, and threaded

through the machine. Rotary motion is then communicated to the skeleton-drums by the means already described; and the protecting wires are thereby lapped or twisted helically round the core of insulated wires, so as to form a strong and compact electric conducting cable. As this operation is proceeding, the cable is taken up by an arrangement of gripping-wheels *q*, which are rotated by means of a worm and worm-wheel, or other analogous contrivance, taking its motion from the machine. The cable is then passed over guide-pulleys, and let down through the stern of the vessel (which is supposed to be proceeding slowly in a forward course) into the water, and sunk in the usual manner of securing submarine lines of telegraph wires. To the take-up rollers or wheels *q*, a measuring apparatus, for shewing the length of covered cable that has been passed out, may be connected; and thereby the speed at which the vessel is required to move, to keep the cable taut, will be indicated.

The arrangement of counting apparatus, which the patentees propose to employ for this purpose, is shewn at fig. 11. It consists of a series of numeral wheels *a*, and ratchet-wheels *b*, of ten teeth, affixed thereto. These wheels are mounted loosely on a common shaft *c*, which has its bearings in the counting-box; and the wheels are driven round by means of pawles *d*, *d*, mounted loosely on a crank-shaft *e*, and propelled forward by the rotation of the crank-shaft. The periphery of all the numeral wheels, except the last, is notched, as shewn in the side view fig. 12, to correspond with the tenth tooth of the ratchet-wheels; and the pawles *d*, are of such a breadth (with the exception of the first) as to be able to take into the teeth of the ratchet-wheels belonging to the next adjoining numeral wheel. When, therefore, the notch in the periphery of the first numeral wheel is presented to the second pawle, that pawle will fall into contact with its own ratchet-wheel, and, at the next movement of the crank-shaft, drive round that wheel, and thereby count 10. The like operation will take place as every tenth tooth is acted on by the first pawle; and, when ten have been acted upon by the second pawle, the third pawle will come into operation and indicate 100; and so on through the range of wheels.

To enable the operator to know the state of insulation of the cable during the whole time that it is in the progress of manufacture, the following means is employed:—The in-board extremities of the insulated wires are severally affixed, by a binding-screw, to a disc-wheel, mounted on an extension of the shaft, which carries the reel *o*, (fig. 8.) The disc-wheels

may be made of some non-conducting material; and the wires may be threaded through them, as shewn in the sectional view, fig. 13; but, in that case, they must have a ring of metal on their peripheries, to receive the pressure of a metal spring, in connection with a signal apparatus. The binding-screws are connected to the metallic periphery of their respective disc-wheels; and thus, though the wheels and wires are rotating, a metallic circuit may be maintained between the battery at one extremity of the cable, and a signal apparatus at the other. It will thus be understood that, if a continuous current is maintained between these two points, and along all the insulated wires, the breakage of any one of these wires will be immediately notified; and thereby the attendant will be enabled to remedy the defect immediately it occurs.

At figs. 14, and 15, a modification of the apparatus just described is shewn. In this arrangement, it is proposed to combine four groups of insulated wires (each having a protecting covering of metal strands or wires) with a chain-cable as a flexible core. For this purpose, a vessel is fitted with four sets of machinery analogous to that before described, as shewn in longitudinal view at fig. 14, and in cross section at fig. 15: which sets of machinery act simultaneously and at the same speed, and surround the insulated wires with strands of protecting wire. These several cables, thus constructed, are drawn towards a central point by four guide-rollers *a*, (shewn best in the detached view, fig. 16); and between these the chain, which is to form the core of the cable, is drawn from the reel *b*, and is passed through a reel *b**, together with the insulated wires, by means of the gripping-wheels *c*. The reel *b**, carries four bobbins, supplied with wire; and, as the combined cable passes through it, the reel is rotated, and thereby caused to "serve out" the wires on the bobbins, and bind the several parts together, as indicated by fig. 17. When it is not thought desirable to employ a chain as a core, a hempen core may be used, to preserve the sets of insulated wires in their respective positions. These insulated wires may be bound together by covering wires or strands, in the ordinary manner of platting, instead of being "served over" with binding wires by a rotating reel, as before described.

From the foregoing description, it will be understood that insulated telegraph wires, for land as well as marine purposes, may be prepared by the improved machinery. This machinery is also adapted for making wire and hempen ropes.

The patentees claim, First,—the mode of insulating suspended wires at their points of support, as above described.

Secondly,—the arrangements of machinery above described for manufacturing telegraph cables. Thirdly,—the setting up of such or analogous machinery on board steam or other vessels, whereby telegraph cables may be manufactured and submerged simultaneously. Fourthly,—the mode herein described of testing the conducting power of telegraph wires while they are being manufactured into cables, for the purpose above set forth.—[*Inrolled September*, 1852.]

To George Little, *of New Peckham, in the county of Surrey, electro-telegraphic engineer, for improvements in electric telegraphs, and in various apparatus to be used in connection therewith; part of which improvements are also applicable to other similar purposes.*—[Sealed 14th March, 1851.]

These improvements consist, firstly, in suspending the indicators, or any other parts of electric telegraphs that may be desired, by means of magnetic attraction; and, secondly, in supporting the indicators of electric telegraphs by means of floats of blown glass or other suitable buoyant material, enclosed in glass tubes containing any suitable fluid.

In Plate IV., fig. 1, is a front view of an arrangement of apparatus for suspending indicators by magnetic attraction, according to the first part of this invention; fig. 2, is a side view thereof; and fig. 3, exhibits the magnet and indicator detached. *a*, is a permanent magnet, fixed in a socket *b*, which is secured to the dial-plate of the instrument by a screw and nut at the back; *c*, is an indicator or needle, suspended from the magnet (by the attractive power of the latter) in the centre of the conical guide *d*, fig. 3; *e*, is a glass tube, containing alcohol, in which the indicator is immersed; and *f*, *f*, are coils of wire, secured to the tube *e*, by the connecting piece *g*. When a current of electricity is caused to pass through the coils of wire, the lower end of the indicator or needle will move to the right or left; and by this means any number of conventional signals may be communicated. The alcohol in the tube is stated by the patentee "to act as a continuous lubricator, by preventing the indicator from striking against the sides of the glass tube, which act as stops to the same."

Fig. 4, represents an external view of the apparatus employed for carrying out the second part of the invention. *h*, is a coil of wire, in the centre whereof is placed a glass tube *i*, (shewn separately at fig. 5,) containing spirit or any other suit-

able fluid, in which a magnet *j*, is suspended by means of a float *k*. On a current of electricity being transmitted through the coil of wire *h*, the magnet will be drawn downwards, carrying with it the float *k*, out of sight, or nearly so; and by repeating such movement of the magnet and float, any desired signals may be indicated. This apparatus is attached to the dial-plate of the instrument by passing a screw through the slot *l*.

The patentee does not confine himself to the above arrangements. He claims, First,—any arrangement, in accordance with the mode above described, for the suspending of indicators by means of magnetic attraction for electric telegraph purposes. Secondly,—the supporting of indicators by means of floats, in tubes of spirits or other suitable fluids, for electric telegraph purposes.—[*Inrolled September*, 1851.]

To JOHN WHITEHEAD, *of Holbeck, in the parish of Leeds, in the county of York, machine manufacturer, for improvements in machinery for preparing, combing, and drawing wool, silk, cotton, and other fibrous substances.*—[Sealed 29th March, 1852.]

THIS invention consists in certain novel combinations and arrangements of machinery for carrying out the several operations of preparing, combing, and drawing wool, silk, cotton, and other fibrous substances requiring such operations.

In plate IV., fig. 1, is a longitudinal section of the first of three improved arrangements of preparing machinery which constitute the first head of this invention. *a*, is an endless feeding-sheet, which passes round two rollers a^1, a^2, and on it the staple to be operated upon is spread by hand. The forward movement of this sheet causes the staple to pass under a heated fluted roller *b*, mounted in the slotted bearings which carry the roller a^2; and by this fluted roller, the staple is delivered on to a rotating porcupine or card-roller *c*, situate contiguous to a cylinder *d*, the periphery whereof is covered with card-teeth, or wire, or bristles. Immediately above the porcupine-roller, and extending over its whole length, a plate *e*, having a smooth edge, is fixed, for the purpose of preventing the cylinder *d*, from taking the material direct from the fluted rollers, and thereby ensuring the action of the porcupine-roller upon the staple under operation. At the opposite side of the cylinder *d*, there is a screw-gill drawing-head *f*,—on to the combs or gills of which, the staple is lashed by the rotating card-

cylinder. The staple is then carried by the travelling gills to the drawing-rollers *g*, in a prepared state, to be delivered out of the machine into cans, or rolled up into balls, as shewn. The gills are actuated by screws, in the ordinary manner of screw-gill machinery; or they may be actuated by the arrangement hereafter to be described under the third head of this invention; and the movements of the several parts may be taken from the main driving-shaft *h*, by means of the gearing indicated by the dotted pitch lines, and by the bands or straps shewn.

In the second arrangement of preparing machinery, the feeding-sheet carries the staple, as before, under a heated fluted roller, whence it passes between a pair of common card feeding-rollers, which deliver it to an ordinary arrangement of carding-engine, consisting of a main card-cylinder, with the usual workers and strippers surrounding it. The staple having been subjected to the action of these card surfaces, is stripped off the main cylinder by a doffing-cylinder, and delivered on to the teeth of the combs of a screw-gill drawing-head, by means of a reciprocating brush. It is then straightened, or partially combed, by the action of the gills, and is drawn into an endless sliver and passed through a conductor, by a pair of drawing-rollers; and in this state of sliver it is delivered out of the machine.

The third arrangement of preparing machinery differs from the preceding one, in the combs or gills being inverted; that is, they work with their teeth downwards instead of upwards, which is the usual position.

The second head of this invention consists in certain novel arrangements of machinery, whereby the two operations of preparing and combing may be effected simultaneously.

Fig. 2, exhibits, in transverse section, one arrangement of double-action machine, for preparing and combing wool and other fibrous substances. This machine is provided with two sets of preparing machinery, similar to that shewn at fig. 1; and between these there is an endless travelling comb, intended to receive the staple from the two sets of gill-machinery, and carry it under a drawing-off head, by which it is to be drawn off in the usual way of cleaning such travelling combs. *a, a*, are the feed-aprons or sheets, for carrying in the staple to be acted upon; *b, b*, are heated fluted rollers; *c, c*, porcupine-rollers; *e, e*, the smooth-edged plates, for guiding the staple; and *d, d*, the card-cylinders, which lash the staple on to their respective gills *f, f*. The transference of the staple from the gills to the endless travelling comb is effected by

two reciprocating combs *g, g*. Each comb *g*, is attached to two sliding-pieces *h*, which work in guides in a pair of rocking arms *i*, carried by a stationary axle *k*. These arms are furnished with an antifriction-bowle, against which a cam *l*, keyed to an axle *m*, works; and affixed to opposite ends of the same axle is a pair of crank-arms *n*, which are severally connected to an arm *o*, jointed loosely to a sliding-piece *h*. By the rotation therefore of the axle *m*, a traverse motion is communicated to the comb *g*. In front of each drawing-gill-head is a stationary brush *p*, the use of which will be presently explained. The combs *g*, are each provided with a hollow brush *q*, which surrounds its comb, moves with it, and is capable of receiving an independent up-and-down motion. These brushes have a tendency to retain their highest position (as respects their comb) by reason of a helical spring being interposed between the frame of the brush and the comb; but, when the brush is brought under the bowle of a rotating arm *r*, keyed to a shaft *s*, the bristles of the brush are depressed below the teeth of the comb, and will thereby thrust off from the teeth of the comb any staple it may contain. When the comb has been thus cleared, it will be ready to return to its screw-gill drawing-head for a fresh supply. To effect this operation, the pressure of the arm *r*, on the brush, is (by reason of the continued rotation of its shaft *s*,) first removed; the increasing radius of the cams *l*, then coming under the bowles of the arms *i*, raises the comb *g*, to the proper elevation for striking into the staple, which is carried by the teeth or pins of the last gill of the drawing-head; and, at the same time, the rotation of the shaft *m*, causes the crank-arms *n*, to propel the comb towards the drawing-head. When the comb *g*, has arrived immediately over the brush *p*, the smallest diameter of the cams will be presented to the bowles of the arms *i*; and this will cause the arms *i*, to fall, whereby the comb *g*, will be made to strike into the staple which projects from the drawing-head. The brush *p*, being situate immediately below the staple, will have the effect of thrusting the staple in between the teeth of the comb. The comb *g*, now charged with staple, is carried back by the rotating crank-arms *n*, to the centre of the machine; and the brush *q*, which surrounds the comb, being depressed by the means already described, the staple will be forced from the comb *g*, into the travelling endless comb *t*, which is situate midway between the two screw-gill drawing-heads. In this way the prepared staple will be transferred from the two drawing-heads alternately to the central comb,—the staple

being laid thereon, so as to project from both sides of the comb. A portion of the central comb *t*, is shewn at fig. 3. It is composed of short bars 1, connected together by links 2, and carrying a brass plate, filled with steel pins, standing at right angles therefrom. This endless chain of combs passes over and under a cast-iron bed *u*, which is countersunk at its upper and lower edges, to receive and guide the chain, and hold it up to its work; and each end of this bed is forked, in order to form bearings for a pair of chain-wheels, by which the chain is rotated.

The patentee exhibits a modification of this double-action machine, in which prepared slivers are fed on to the screw-gill drawing-heads by means of a pair of heated fluted rollers, in lieu of the staple being lashed on the gills by rotating card-cylinders, as in the last described arrangement; but, in other respects, this preparing and combing machine is similar to that shewn at fig. 2.

Fig. 4, is a transverse section of an arrangement of preparing and combing machinery, in which two screw-gill drawing-heads and their feeding apparatus receive a reciprocating motion, for the purpose of feeding the staple on to the central endless band of combs without the intervention of the reciprocating combs *g*, *g*, fig. 2. Fig. 5, is a side view of one of the drawing-heads and its appurtenances. *a*, is a cast-iron frame, which carries the screw-gills *b*, and the rollers *c*, for feeding the same. This frame slides in horizontal guides, made in a table *d*, to which an up-and-down motion is imparted by means of a pair of cams *e*, keyed to the main driving-shaft *f*, and working in contact with a pair of bowles *g*, with which the table is provided. The table slides in vertical guides, formed in the main framing *h*, which also carries the gearing and other mechanism for communicating motion to the drawing-head. As the various parts are analogous for the two drawing-heads, and the action of both drawing-heads is the same, it will only be necessary to explain the means whereby the staple is laid over the endless comb, with reference to one drawing-head. It should be remarked, however, that the drawing-heads, which approach the central comb from opposite sides, advance alternately and lash the wool on to the comb-teeth. The endless travelling comb being constructed and sustained in its place in the manner already described with reference to the arrangement shewn at fig. 2, it is intended to transfer the staple directly from the drawing-head to that comb, and then to draw off the staple therefrom by means of an ordinary drawing-off head, and deliver it out of the machine in the form of a roving or sliver. To effect

this, rotary motion is given to the main driving-shaft *f*, in the direction of the arrow, whereby the cam *e*, is caused to raise and lower the table *d*, and with it the drawing-head. At the same time a cog-wheel 1, keyed to the shaft *f*, and gearing into a wheel 2, carried by the joint stud of a pair of vibrating arms *i*, drives that wheel 2, which, in turn, drives a wheel 3, keyed to a horizontal shaft *k*, supported in bearings attached to the table. The arms *i*, are respectively supported by the shafts *f*, and *k*. On the inner end of the shaft *k*, is a crank-arm *l*, which is connected by a rod *m*, to the frame *a*, of the drawing-head. At every revolution therefore of the shaft *k*, the drawing-head is caused to advance towards and recede from the endless comb. Rotary motion is communicated from this shaft *k*, by means of a bevil-pinion 4, to a pinion 5, keyed to a shaft 6. This shaft has its bearing in a rocking bracket 7, carried by the shaft *k*; and its upper end slides freely in a bracket-bearing, carried by a shaft 8. A feather on the shaft 6, takes into a groove cut in the boss of a bevil-pinion 9,—and thereby that pinion is made to rotate; and as the pinion 9, gears into a pinion 10, on the shaft 8, it causes that shaft to rotate, and with it the gill-screws, by means of the gearing shewn. The feed-rollers are caused to rotate and feed in the staple from the ball (which rests in suitable supports attached to the frame *a*,) in any convenient way. It will now be understood that, as the drawing-head advances towards the central comb, it will be raised by means of the cams *e*, in order that it may attain the proper position for lashing the fibre upon the teeth of the comb. When it has reached the end of its course, the smallest radius of the cams *e*, will suddenly come in contact with the bowles *g*, and cause the table, and with it the drawing-head, to fall into their lowest position. By this means, the staple which projects from the last gill will be lashed into the teeth of the central comb; and, if desired, a brush *n*, situate immediately above the comb (see fig. 4,) may be made to descend and thrust down the staple between the comb-teeth. The drawing-head will now retire; and, at the same time, the drawing-head at the opposite side of the comb will advance, and, in like manner, lash the staple (which its screw-gills have opened out) on to the comb;—the endless chain of combs having, in the meanwhile, advanced in its line of progress towards the drawing-off head. It should be remarked, that the progress of the chain of combs is continuous; and that, by this double-feeding operation, the comb is charged with two layers of staple, which admits of the drawing off being carried on simultaneously on both

the sides of the comb: whereby a better result will be obtained than heretofore, in consequence of the increased friction of contact which is set up between the fibres of the staple. For this purpose, the endless chain of combs *t, t,* is provided, on either side thereof (in advance of the screw-gill drawing-head), with a drawing-off head, consisting of two pairs of rollers, which are driven in any ordinary manner, and take off the staple from either side of the chain of combs, and pass it to a trumpet-mouth; and such trumpet-mouth, through the action of a pair of drawing-rollers, will condense the now combed staple into a sliver or coarse roving, which may be received into cans, or wound into balls, as thought most convenient. The combs are cleared of the noils and waste by means of strippers, as usual in such machinery. Instead of the compound vertical and horizontal motion being given to the screw-gill drawing-heads, the patentee proposes, in some cases, to effect the lashing of the staple on to the endless chain of travelling combs, by giving the drawing-heads a simple backward and forward motion, and raising and lowering one end of the travelling combs to meet the advancing gills. Instead of taking the staple from balls of prepared sliver, the staple may be fed into the machine by means of endless aprons, which have a reciprocating motion with the drawing-head; and, when this arrangement is adopted, a porcupine or card-roller is interposed between the feed-rollers and the screw-gills.

The third head of this invention consists in a novel arrangement of apparatus to be used for raising and lowering the fallers of the screw-gill drawing-head, instead of the tappets or cams hitherto employed. This improvement is shewn at fig. 6, which is a cross section of a drawing-head. *a, a*,* are two pairs of vertical sliding rods, set at opposite sides of the drawing-head,—the one pair to raise and the other to depress the gills or fallers. These rods *a, a*,* are each provided with a projecting shoulder, which, in one pair, serves to lift the fallers, and in the other to drive them down to the lower table, when they have arrived at the end of their course. The rods are jointed loosely to rocking levers *b, b,* keyed to a rock-shaft *c,* which, through a connecting-rod and arm *d,* receives its motion from the crank-shaft *e*; and thus an up-and-down motion is communicated to the lifting and depressing-rods *a, a**. At the lifting side of the drawing-head, a vertical spring *f,* is provided, which serves to sustain each faller when it has attained its highest position, prior to being propelled on to the top table; and thereby greatly assists in

the transference of the fallers from the lower to the upper table. The elasticity of the spring will allow of the free upward passage of the fallers; but when they have passed it, the spring will fly forwards and sustain the faller in the manner stated.

The patentee claims, First,—the arrangement of machinery shewn at fig. 1, or any modification thereof, for preparing wool, silk, cotton, and other fibrous substances, when such operation is effected by lashing the staple on to a screw-gill drawing-head, by means of a rotating cylinder covered with teeth, combs, or brushes; and he also claims the other combination of carding and screw-gill machinery, as described under the first head of his invention, or any modification of such combination of machinery, for effecting the like operation. Secondly,—he claims the several arrangements of machinery described under the second head of this invention, for preparing and combing wool, silk, cotton, and other fibrous materials; also the filling a central travelling comb, by means of two or more traversing or reciprocating combs or screw-gill drawing-heads, set one or more on each side of the travelling-comb; and also the application of two or more drawing-off heads, set one or more on each side of the travelling-comb, whereby the advantages above set forth may be attained.

Under the third head of the invention, he claims the arrangement of apparatus shewn at fig. 6, for raising and depressing the gill-fallers, in lieu of the cams heretofore employed for that purpose.—[*Inrolled September*, 1852.]

To Samuel Fox, *of Stocks Bridge Works, Deepcar, near Sheffield, for improvements in umbrellas and parasols.*—[Sealed 6th April, 1852.]

This invention consists in constructing the ribs and stretchers of umbrellas and parasols of steel, formed into hollow trough-like shapes.

The patentee takes a narrow fillet or sheet of steel, and bends it, by means of rollers, into the sectional form exhibited at fig. 1, in Plate III.; and then he uses the steel, so bent, for making the ribs and stretchers. He states that he is aware that solid ribs and stretchers of steel, and also ribs and stretchers of steel tubes, have heretofore been employed in making umbrellas and parasols, but not with such advantage as results from the use of open trough-like ribs and stretchers of steel (or it may be other metal) according to his invention. The strength of the metal ribs will vary according to the size,

length, and strength, desired for particular sizes of umbrellas and parasols. In making ribs 26 inches long, he has employed steel wire of No. 13, gauge, and, after having annealed the wire, has passed it between plain rolls, whereby it is flattened into a narrow strip or fillet, in width about No. 6, wire gauge. This narrow strip or fillet is annealed before it is introduced between the rollers, which convert it into a trough-like form. After it has been acted upon by the rollers, the strip is again annealed; and then it is straightened and cut into suitable lengths for ribs and stretchers. For heavier and stronger ribs, thicker wire must be employed; and for lighter and weaker ribs and stretchers, it is requisite to use wire of a smaller size.

The lengths of trough-like metal, obtained in the manner above described, are made into ribs and stretchers as follows: —The lower end of the rib is first subjected to the action of tools in a fly or other press, whereby its sides are pressed somewhat in towards each other, as shewn by figs. 2, and 3, which represent front and side views of the lower end of a rib; a wire eye *a*, exhibited in side and edge view at fig. 4, is introduced into the end of the rib, which is then submitted to a second pair of tools in a suitable press, whereby the edges of the metal are shut, and a knob or proper tip-form is given to the end; and after this, the end is acted upon by another pair of tools, suitably formed to press in the sides, so as to close them into the eye, as shewn at fig. 5. In order to make the other end of the rib of a proper form for entering the "top notch," its sides are flattened between a suitable pair of tools, as represented at fig. 6; then a small piece of steel or other metal *b*, (shewn separately in edge view at fig. 7,) is introduced, and the end again subjected to pressure between a pair of tools, by which it is caused to assume the form represented at fig. 8; and, finally, it is rounded by means of a file, and a hole pierced in it, so that it will present the appearance exhibited at fig. 9.

Each rib is connected to its stretcher by a plate or strip of metal, which is first bent into the form shewn in plan and side view at fig. 10; then a rib is placed within it, and, by means of a pair of pressing tools, the plate is bent into the form represented in plan view by fig. 11, in front view by fig. 12, and in side view by fig. 13; and, after this, by means of a pair of tools, the patentee raises the side and forces the ends of the plate tightly into the trough. The plate now appears as indicated by figs. 14, 15, and 16; and after the projecting portions have been perforated, the stretcher is connected thereto

by a pin-joint, in the manner shewn at fig. 17. The ribs and stretchers are hardened and tempered before the plate is applied for connecting them together.

In the manufacture of the stretchers of open trough-like metal, both ends are made alike and are formed similar to the top ends of the ribs.

The patentee states that he does not confine himself to the above details; but he claims the improvements in the manufacture of umbrellas and parasols hereinbefore described.—[*Inrolled October*, 1852.]

To AUGUSTUS SIEBE, *of Denmark-street, Soho, in the county of Middlesex, engineer and machinist, for improvements in machinery for manufacturing paper,—being partly a communication.*—[Sealed 1st May, 1852.]

THIS invention consists in the construction of two improved machines; the first for knotting or straining paper pulp—the second for rolling, flattening, and glazing paper. The knotting or straining machine is designed to arrest and keep back the knots, and other foul or objectionable matters, out of the pulp about to be made into paper, in order to produce a finer and stronger paper, by leaving all the longer fibres in the pulp free from knots, and causing a smaller loss of stuffs than by the previously known modes of straining pulp for the making of paper. The main feature of improvement, as respects the knotting or straining machine, is the peculiar construction of strainer or sieve employed, and the means of agitating the pulp and forcing it through the strainer by the action of reciprocating fans.

In Plate III., fig. 1, represents a longitudinal elevation of a complete machine, taken partly in section; and fig. 2 is a horizontal or top view of the same,—certain portions being removed to shew the internal construction of the operating parts. The patentee first describes the peculiar construction of the strainer or sieve. Fig. 3, represents the upper or under surface of a ring of brass or other suitable metal, smooth on the inner surface, but bevilled and V-edged on its outer periphery. Rings of this form, in any suitable number (say forty or more), are to be combined, as shewn in the sectional view, fig. 4; and they are to be held together by vertical rods (say six), passed through all the corresponding holes of the series; and being pressed tightly, by nuts screwed at top and bottom of the rods, the rings will be all kept securely and

firmly in contact with each other, and form a cylindrical vessel, suitable to be employed as a sieve or strainer of the pulp, which is intended to be passed laterally through it. In order to form passages for the pulp between the several rings, thin collars or washers are to be put upon all the vertical rods, between the rings, before they are screwed up tight: the thickness of these collars or washers must depend upon the fineness of the paper intended to be made; for according to the width of the spaces between the several rings so will the pulp be more or less strained, and, consequently, the paper be of a finer or coarser quality.

Several of these cylindrical sieves are to be fixed upright in a box or pulp chest. Each sieve is to be closed at bottom; and the tops thereof are to have covers (which the patentee calls hoppers), with apertures to receive the rough pulp and conduct it into the sieves. Within each cylindrical sieve is placed a reciprocating fan, by the movements of which the pulp will be driven, by centrifugal force, through the narrow spaces between the rings. These fans it is proposed to make hollow and of a star form, as represented at figs. 1, and 2. They are to be constructed of thin sheet-copper or other suitable material, as light as may be practicable, and closed at top and bottom. A spindle or shaft is passed perpendicularly through, and made fast to the fan, for the purpose of enabling it to turn upon a pivot at bottom; and the shaft being extended upwards, will admit of the fan being turned by any convenient means when mounted within the cylindrical sieve.

Having described the improved construction of sieve, and of fan to be placed within it, the patentee proceeds to shew in what manner the same or several of them may be mounted in a machine, and made to perform the operation of straining paper pulp:—A strong chest of wood *a*, is provided, and lined, if necessary, with zinc, lead, copper, or other suitable material, into which the pulp is to be forced through the strainer. In the bottom of the chest are fixed the circular dishes or rings *c*, in which the cylindrical sieves *d*, are to be inserted and fixed. A fan *e*, of the construction above described, is then to be placed within each cylindrical sieve; the pivot of its axle at bottom being supported by a suitable step or socket *f*; and the upper part of the axle turning in a bearing in the longitudinal bar *b*, fixed along the top of the chest. The cover or hopper *g*, with its ring, is then placed over the sieve, and suitable machinery applied, to give the fans rapid reciprocating movements on their axles. The reciprocating motion is effected by attaching an arm *h*, as a lever, to the top

of each of the vertical fan shafts, and connecting these arms to crank-rods *i*, connected to an excentric or crank *j*, as shewn in fig. 2. This being a system of ordinary driving-gear, it need not be further explained. The prepared rough pulp is to be poured from above the machine into the straining cylinders *d*, through the hoppers; and the fans *e*, being then put in rapid vibratory motion, will agitate the pulp, and by their centrifugal force the pulp will be forced laterally through the narrow passages of the strainers *d*, into the pulp chest *a*, leaving the knots, lumps, and other injurious substances, in the interior of the sieves, at bottom: these substances may be drawn off at intervals, whilst the straining operation is going on, through openings *k*, in the bottom of the chest, by means of slides, worked by handles *l*, at the end of the machine.

In order to prevent the strained pulp settling at the bottom of the chest, after it has passed through the sieves, vibrating flap-agitators *m*, are placed within the chest. It will, of course, be understood, that as the chest fills, the strained pulp will flow over the edge of the chest on to the wire-cloth, as usual.

The patentee describes another arrangement of gearing for driving the pulp straining machine. In this instance, a long horizontal shaft, with three cranks formed in it, extends from one end of the chest nearly to the other end; which cranks are severally connected by crank-rods to the ends of the respective levers *h*, on the top of the fan-shafts; and these levers being set in different positions to each other, will, by means of the three-throw-crank, act more uniformly, and agitate the pulp with better effect than the machinery of the former arrangement. As it is necessary that the joints of the connecting-rods and levers, in this last-described machine, should have a considerable amount of free action, the patentee makes those joints with a sort of ball-and-socket connection.

The improved method of rolling, flattening, and glazing paper, consists in passing sheets of paper between two endless bands, made of thin metal plates (by preference, very thin plates of steel), which are to be distended over tension-rollers, and passed between two heavy pressing-rollers. Fig. 5, is a side or longitudinal elevation of the machine in which these endless plates are mounted. The heavy pressing-rollers *p*, are supported in two standards *q*, and are geared together by toothed wheels *r*, on their axles, in the usual way,—the rollers turning freely, with the ordinary arrangement for bringing their peripheries closer together, by means of screws, as may be required. The endless bands are distended over tension-rollers *t*, mounted on frames *u*, placed at some little distance

from each end of the pressing-roller standards; and these bands are passed between the pressing-rollers *p*, where they are brought nearly in contact. Rotary motion being given to the lower pressing-roller, by any convenient means, the upper pressing-roller will turn likewise. The paper to be pressed is then introduced between the endless bands at one end, when, by the rotation of the pressing-rollers *p*, the bands *s*, with the paper, will advance and pass between those rollers, and the paper become flattened or glazed, as may be required, and discharged from the endless bands at the opposite end. In order to glaze paper by this machine, one of the endless bands must be made to travel faster than the other; and this is effected by employing coupling-wheels, which have dissimilar numbers of teeth gearing into each other upon the axles of the two pressing-rollers.

The patentee claims, as new, the construction of sieve or pulp strainer, formed by rings, as described above; but he does not intend to confine himself to circular rings, as nearly the same effect might be produced if those rings were polygonal or of any other slight variation in form, provided they were combined or piled one on another, as described. He also claims the novel construction of vibratory fans, without intending to confine himself to the number of vanes in each, or the particular forms of such vanes. And, Lastly,—he claims the employment of endless metallic bands, between which paper may be passed under pressing-rollers, to be pressed or glazed, as above described.—[*Inrolled November*, 1852.]

To JOHN LINTON ARABIN SIMMONS, *of Oxford-terrace, Hyde-park, in the county of Middlesex, Captain in the Royal Engineers, and* THOMAS WALKER, *of the Brunswick Iron Works, Wednesbury, in the county of Stafford, Esq., for improvements in the manufacture of ordnance, and in the construction and manufacture of carriages and traversing apparatus for manœuvring the same.*—[Sealed 29th April, 1852.]

THIS invention relates, firstly, to the manufacture of pieces of ordnance; secondly, to the manufacture of gun-carriages; and, thirdly, to the construction of apparatus for traversing and manœuvring ordnance.

The piece of ordnance is to be made of wrought-iron, forged solid, and afterwards bored out to the required caliber: the bore may be either smooth or rifled. The trunnions are

to be forged on or added afterwards. The mass of the piece of ordnance is formed by placing a number of segmental bars of rolled or hammered iron together round a cylindrical core, as shewn in transverse section at fig. 1, in Plate IV.,—such bars being twisted in the length of the faggot round or partly round the core. The faggot is then welded into a cylinder, which constitutes the core of a second cylinder, formed by placing segmental bars of rolled or hammered iron around the first cylinder, and welding the same together,—the bars in the second faggot being twisted in an opposite direction to those in the first faggot. This process of faggotting may be repeated, if necessary, until the mass arrives at the required dimensions. The core whereon the first cylinder is formed (and which is afterwards completely removed in the boring) may be of soft iron; but the segmental bars must be of a hard steely iron. The trunnions may be forged either upon the piece of ordnance or separate from it. In the latter case, they may be forged upon a ring, or connected together by a solid mass, the centre of which is afterwards bored out; so that, either way, the trunnions project on each side of a ring, which is fitted over the piece of ordnance in a heated state, and shrinks on cooling, so as to rest firmly upon a bed or seat upon the gun, turned to receive it. A ring of wrought-iron is afterwards shrunk on in front of the trunnion ring,—a suitable groove having been turned to receive the same. A cannon, constructed according to this invention, is shewn, half in elevation and half in plan view, at fig. 2, where *a*, is the trunnion-ring, which is shrunk on to the bed indicated by the dotted lines *b*; and *c*, is the wrought-iron ring that is shrunk into the groove *d*, in front of the trunnion-ring. Sights of any description may be affixed to the gun; the muzzle may be furnished with moulding; and the cascabel may be made of any desired form.

The gun-carriage (represented, in side elevation, at fig. 3,) is formed of wrought-iron, and consists of two cheeks or sides, placed in vertical planes, parallel to the axis of the bore of the piece of ordnance to be mounted, one under each trunnion. Each cheek consists of a triangular arrangement of bars of wrought-iron, either separate or united together by welding. One side *e*, of the triangle, slopes downwards to the rear, another side *f*, slopes to the front, but is nearly vertical, while the base *g*, is nearly horizontal, connecting the two sides at their lower extremities as a tie-bar. At the apex of each triangle is formed a trunnion-box or seat, of a semicircular form,—the chord of the semicircle being inclined downward

towards the front of the gun. Cap-pieces *h*, are fitted over the trunnions, and fixed on the jambs or sides,—completing, with the trunnion-boxes, a circle around the trunnions. The cheeks are connected, near their apices, by a transverse bolt *i*, placed under the trunnion-boxes, so as not to interfere with the vertical movement of the piece of ordnance, when being elevated or depressed. The cheeks are likewise connected by the front and rear axles *j*, *k*, which pass through both cheeks; and there is also a system of diagonal bracing between the transverse bolt, before mentioned, and the front axle. The trucks *l*, may be of cast or wrought-iron, and grooved, flanched, or plain; and the fore trucks are to be capable of being fixed to their axle, when desired, so as to prevent them from revolving. A bar is placed between the cheeks, under the breech, to carry an elevating apparatus, which may be either a screw or a graduated arc.

The patentee states that the principle of this carriage may be applied to field and garrison carriages (as shewn at fig. 4,) by lengthening the bolt *i*, that connects the cheeks under the trunnions, so as to form the axle of a pair of large wheels (indicated by the dotted circle *m*); by omitting the bases or tie-bars of the triangular cheeks, and so much of the vertical or front bars *f*, as may be necessary; and by lengthening the sloping or back bars *e*, so as to form a trail;—and then by attaching to the trail a chain, furnished with drags *n*, to be applied under each of the front wheels, the same principle can be applied for the purpose of checking the recoil, if, from the circumstances under which the piece of ordnance is fired, it should be deemed advisable to check the recoil.

The traversing platform, which constitutes the third head of this invention, is for the purpose of carrying a gun-carriage, having its piece of ordnance mounted upon it ready for firing, with a view to its being traversed freely upon a fixed centre. Fig. 5, is a side elevation of the traversing platform; and fig. 6, is a transverse section of one of the sides thereof, taken in the line 1, 2. It consists of two longitudinal sides or beams *o*, parallel to the axis of the gun, for supporting the trucks of the gun-carriage. These sides are connected by a system of transverse ties and struts, with diagonal bracing of timber or iron, and may be formed of timber, shod or faced with wrought or cast-iron. Each side has two parallel inclined planes *p*, *q*, one to carry the fore truck of the carriage and the other the rear truck, and so arranged that the way for one pair of trucks shall not interfere with that for the other. The platform is supported by four trucks *r*, placed

under the longitudinal sides or beams, near their extremities, and of such a height that the under side of the platform is just clear of the curbs on which the trucks travel. The inclination of the planes on which the trucks of the carriage move, is such, that the carriage, when mounted upon the platform with its piece of ordnance, and having its fore trucks fixed to the axle, shall remain at rest, and not have a tendency to run down the incline without assistance. The platform is connected with the centre-pin, on which it traverses, by means of two wrought-iron bars or links *s*, formed with a hole in either end, so that the links at one end fit over two pins *t*, on the under side of the platform, and at the other they fit over the centre-pin.

The patentees claim, First,—the manufacture of ordnance by a series of segmental bars of wrought-iron, faggotted and arranged about a core and cylinder, as above described. Secondly,—the gun-carriage, constructed and arranged as above described, in reference to figs. 3, and 4. Lastly,—the traversing and manœuvring apparatus, constructed and arranged as above described, in reference to figs. 5, and 6.—[*Inrolled October*, 1852.]

To Alfred Vincent Newton, *of* 66, *Chancery-lane, in the county of Middlesex, mechanical draughtsman, for certain improvements in winnowing-machines, being a communication.*—[Sealed 22nd May, 1852.]

The improved construction of machinery which forms the subject of the present invention is shewn in Plate IV.,—fig. 1, being a horizontal section, and fig. 2, a longitudinal vertical section thereof.

One of the objects accomplished by this invention is, winnowing the grain twice by means of a single fan-blower and the same current of air: the first winnowing is effected by passing the grain through the current of air discharged by the fan; and the second by passing it through the current of air entering the fan. It is stated that, by passing the grain once through this machine, it is more thoroughly cleansed than when it has been passed twice through a machine of the usual construction; although the time and labor of passing it once through this machine does not exceed that of passing it once through the ordinary machine. *a*, is the frame of the machine; and *b*, is a casing that encloses both sides, the top, and the back end of the machine,—the front end being open, to allow the chaff and dust to pass freely out. The frame is

surmounted by a hopper *c*, to receive the foul grain, which is permitted to pass gradually and regularly into the machine through an opening in its bottom; and this opening is provided with a register c^1, susceptible of adjustment, to regulate the discharge of the grain, as may be required. Below the hopper, a frame *d*, (which the patentee calls a shoe) is hung by four rods d^1, one at each of its corners; and these rods are hinged at the top to the main frame *a*, or the casing *b*, and, at the bottom, to the lower part of the shoe. The shoe is as much narrower than the space between the two sides of the frame as is necessary to give it sufficient room to swing or vibrate from side to side, to shake the riddles and screens which it carries. The riddle *e*, is placed near the top of the shoe, and in a horizontal position; and the screen *f*, is placed at the bottom of the shoe, and inclined down towards the back of the machine. About the centre of the frame, and behind the shoe, a radial-fan *g*, of the usual construction, is placed within a cylindrical shell *i*. The shell is shorter than the space between the sides of the frame, so as to leave a sufficient passage for air to supply the fan; and it is open at the front, to allow the blast to pass out beneath the riddle through the descending grain. A plate *h*, extends across the opening in the front of the fan, and is hinged at its upper edge to the shell *i*,—its office being to give direction to the blast, which can be deflected more or less (according to circumstances) by lowering or raising the front edge of the plate by means of a cord h^1, that suspends it from a pin on the frame. Behind the fan there is a chamber *k*, from which the supply of air is drawn. This chamber is supplied with air through an upright pipe *l*, at the back, and through a valve *m*, at the top. Its bottom is inclined towards a box *n*, (see fig. 1, and the detached sectional view fig. 3,) placed at one side,—the slope of the bottom being sufficient to cause small grain or seeds, if dropped upon it, to run down into the box; and the bottom of the box is closed by a hinged door n^1, opening downwards, and kept shut by a spring n^2, of barely sufficient strength to overcome its gravity and keep it closed. The valve *m*, at the top of the chamber is of considerable area, and opens inwards. It is held up against its seat by a weight *o*, acting through a lever o^1, whose fulcrum is in the standard o^2. The object of this valve is to prevent variation in the speed of the fan from affecting, except within very narrow limits, the force of the current of air up the pipe *l*. It effects this object when the weight is so adjusted that it is about half open when the fan

is running at a mean speed; for, as the speed of the fan slackens and requires a less supply of air, the downward pressure on the valve will slightly diminish, and the weight *o*, preponderating, will close it, so that the draft up the pipe *l*, may not be reduced; and, when the speed of the fan increases and requires more air, the downward pressure on the valve will slightly increase, and, preponderating over the weight, will open the valve, so that the increased demand by the fan may not increase the draft up the pipe *l*. In consequence of this arrangement, the pipe *l*, supplies a regular and constant quantity of air, not exceeding the minimum demand by the fan; and the complement over and above this regular supply is furnished by the valve *m*. Thus it will be evident, that there is no other variation in the force of the draft up the pipe *l*, than the slight and almost inappreciable amount required to open or close the valve. Beneath the chamber *k*, is placed an inclined trough *p*, whose lower end enters the front side of the pipe *l*. The lower end of the screen *f*, enters the upper end of this trough. Beneath the shoe *d*, is placed an inclined apron or trough *q*, terminating at its lower end in a box *r*, provided with an inclined bottom, at the lower end whereof a door is placed, through which the seeds or other matters that may have accumulated in it may be withdrawn. A large band-wheel *s*, is mounted upon a pin that projects from the side of the frame *a*. This wheel is fitted with a handle, whereby it is turned; and it communicates motion through a band to a pulley *t*. This pulley is secured to the fan-shaft, which it turns, carrying around with it a cone-pulley q^1, on the opposite end of the shaft, which, by means of an endless band, communicates motion to the cone-pulley r^1. The pulley r^1, is secured to the upper end of a vertical shaft t^1, on the lower end of which there is a crank of variable throw. This arrangement is shewn at fig. 4, which represents a view of the under side thereof. It consists of a disc *u*, secured to the end of the shaft t^1, with a groove across its face, in which a plate *v*, is fitted, so as to be capable of sliding therein. This plate carries the wrist-pin *w*, and has a slot made in it, through which an adjusting-screw *y*, passes, to hold it in any position to which it may be set. By sliding the plate *v*, so as to move the wrist-pin *w*, towards the set-screw *y*, the radius and throw of the crank will be diminished; and, by moving the wrist-pin *w*, in the contrary direction, the throw of the crank will be increased. The wrist *w*, of the crank is linked by a connecting-rod *z*, to a pin *x*, on a bracket, secured to the bottom

of the shoe; so that, at each revolution of the crank, the shoe *d*, will make a double vibration or shake, the length of which will depend upon the throw of the crank at the time.

The operation of the machine is as follows:—The wheel *s*, is turned, to make the fan rotate, and thus cause a draft up the pipe *l*, and a blast beneath the riddle, in the directions represented by the arrows; and the shoe *d*, with its riddle and screen, are, by the same operation, put into rapid vibratory motion. The register at the bottom of the hopper is now opened to the proper distance, to allow the foul grain to run down into the machine in such quantity as may be required. The grain, in descending, first meets the riddle, whose meshes are just large enough to allow it to pass freely through them; so that anything larger than the grain—as heads, straws, &c.—will be intercepted and carried over the front of the machine by the blast. The grain will continue falling beneath the riddle *e*, until it reaches the screen *f*,—the blast, during its descent, blowing out the chaff, dust, and other impurities, which are deposited in front of the machine. The meshes of the screen are of such a size that they will intercept the sound grain, but will allow shrivelled grain, small extraneous seeds, sand, and heavy impurities smaller than the grain, to pass through and run down the inclined slide or trough into the box *r*. The grain upon the screen runs down into the trough *p*, and through the same into the pipe *l*, where it encounters an upward current or draft of air, of such strength that it will carry up with it any chaff or light grain, seeds, dust, or other light impurities that may have escaped the first blast, and will deposit them in the chamber *k*. The precipitation of the seeds, &c., from the current of air into the bottom of the chamber *k*, is greatly facilitated by a hanging partition z^1, which deflects the current downwards so suddenly as to give the particles carried in by the draft such a degree of momentum, that they are thrown without the range of the current passing to the fan, and subside into the bottom of the chamber, which conducts them down its inclined surface into the box *n*. Whenever a sufficient quantity has accumulated to about half fill the box, its bottom n^1, opens by the weight, and permits the contents to run out until the weight of the quantity left is insufficient to hold the door open against the action of the spring n^2: in this way the door opens and closes itself, so as to empty the chamber without admitting air. While the lighter substances are being thus carried up the pipe *l*, the sound grain descends

slowly against the current, and is discharged from the pipe into a trough, measure, or other suitable receptacle beneath.

Where there is much straw and chaff mixed with the grain, the bottom of the hopper will have to be connected with the shoe, or otherwise shaken, in order to ensure a sufficiently-regular feeding of the machine. It may also, in this case, be necessary to place a series of fingers between the riddle and shoe, to facilitate the separation of the straw: such fingers should be placed an inch apart, be made of wire an eighth of an inch in diameter, and extend from about the back of the riddle to within about one-third of its length of the front. These wire-fingers should be secured, at their back ends, in a stock, in a manner similar to that in which the teeth of a rake are secured to the head.

The patentee claims constructing and arranging winnowing-machines in such manner that the grain, in passing once through them, shall be twice subjected to the action of the blast of air supplied thereto. Also the method, substantially as herein described, of maintaining a constant blast for the second winnowing of the grain, by combining with the revolving fan, which moves irregularly, a compensating supply-valve, substantially as herein set forth. Likewise the arrangement of an air-chamber between the place at which the second winnowing of the grain is effected and the fan, in which the impurities, separated by the current of air entering the machine, may subside before the air enters the fan. Also the self-regulating discharge-valve, which prevents the admission of air into the machine, while it opens to discharge the impurities separated from the grain, and thus prevents their accumulation at the bottom of the air-chamber.—[*Inrolled November*, 1852.]

To William Henry Dupré *and* Clement Le Sueur, *of Jersey, for improvements in certain apparatus or apparatuses for preventing smoky chimneys; applicable to other purposes of ventilation.*—[Sealed 17th April, 1852.]

This invention consists, firstly, in an improved construction of wind-guard or apparatus for facilitating the discharge of smoke from chimneys, shafts, or flues; and which said apparatus is also applicable for discharging vitiated or impure air from close or confined apartments.

In Plate IV., fig. 1, is a vertical section of the apparatus; fig. 2, is an external elevation; and fig. 3, is a plan view thereof. *a*, is the stem or base, which is fixed on the top of

the chimney; *b*, is the draft cylinder or hoop; *c*, is a conical drum or draft conductor; and *d*, are projecting spiral or curvilinear blades, surrounding the conical drum, for the purpose of catching and deflecting the wind downwards through the passages or channels *e*, which open into the draft cylinder or hoop *b*. It is stated that the effect of the wind upon the conical drum will be to direct the smoke downwards out of the lower end of the draft-cylinder, and to prevent its escape upwards through the curvilinear passages *e*; and by this arrangement, also, the adverse currents of air (which would impede the discharge of the smoke) are prevented from passing down the chimney, flue, or shaft.

The second part of the invention consists in a mode of constructing valves for draft apparatus or ventilators, to be used in roofs, shafts, or otherwise.

Fig. 4, is a front view and fig. 5, a side elevation of one arrangement. Fig. 6, is a front view and fig. 7, a vertical section of another arrangement. *f*, is a wall or fixing plate, formed with a large opening in it, around which there is a raised edge or rim *g*. *h*, is a pipe or hollow band, secured upon the projecting rim or raised edge *g*; and against this pipe the cover or door *i*, shuts,—a space being left between the rim of the door and the raised edge, to prevent them from coming so close together as to collect moisture by capillary attraction. The door *i*, is represented as an open frame; but the central portion thereof is intended to receive a plate of metal; or, if it be required to serve as a means of lighting as well as ventilating, then a sheet of glass is inserted. In figs. 4, and 5, the door *i*, is hinged at its upper edge to the plate *f*; and it is kept more or less open by means of an adjusting catch. In figs. 6, and 7, the door is hinged at the bottom; and the upper part is connected at each side by a cord *j*, with a small counterbalance-weight, which is capable of rising and falling within the pipe *h*: these weights serve to retain the door in any desired position.

The patentees claim, First,—the mode, above described, of constructing wind-guards with curvilinear or otherwise-formed ribs or blades, for catching and deflecting the wind downwards. Secondly,—the opening of the passages between the said ribs or blades into the hoop or draft-cylinder, in connection with the conical drum. Thirdly,—the raised edge of the wall or fixing plate, and the valve-door or cover, for the purposes above described. Lastly,—the action of the balance-weights within the pipe or hollow bead, as above described.—[*Inrolled October*, 1852.]

To Henry Webster, *of Manthorpe, in the county of Lincoln, wheelwright, for improvements in regulating the draft in chimneys or flues.*—[Sealed 25th May, 1852.]

This invention is intended, firstly, to prevent the downward draft in chimneys, occasioned by the setting of the wind in a particular quarter, or by the defective construction of chimneys; and, secondly, to regulate the draft of fire-places, so as to effect a quicker or slower combustion, as may be desired.

When applying the invention to the ordinary construction of chimney, for preventing the downward draft, or the return of the smoke and gases which have passed upwards from the fire-place, the patentee contracts the bottom of the flue, either by the insertion therein of metal cheeks or plates, or by building up brickwork into the sides of the flue. He then applies to the flue a hinged plate or swing damper, the breadth of which is about equal to the breadth of the flue, and which is otherwise of sufficient size to close the opening of the flue when required. This damper is of such a form, or is so mounted, as to intercept any downward current; and it is furnished with an adjusting-screw, or other analogous contrivance, whereby it may be set to any desired angle, so as to contract or enlarge the vent for the escape of the gaseous products of combustion, and thus regulate the draft.

In Plate IV., fig. 1, is a front view of a kitchen fire-place, fitted according to this invention; and fig. 2, is a vertical section, taken in the line 1, 2, of fig. 1. In this instance, the flue is contracted by side plates *a, a,* set apart at a distance about equal to the width of the fire surface, and reaching down to the grate; but it is not essential that the plates should descend below the bottom of the flue. Affixed to these side-plates is a cross-piece *b,* which is fitted on its inner face with a ledge or projection, to carry the damper *c.* Instead of merely resting on a ledge, the damper may be provided with socket-pins, on which it can rock;—the pins being supported in suitable sockets, formed on the inner face of the cross-piece *b.* The damper takes a zigzag form at its upper part; and attached to and projecting from the back of the flue, is a piece of sheet-metal *d,* forming a shoulder, to receive the damper when depressed, and constituting, with the damper, a zigzag channel *e,* when the damper is raised, for the passage upwards of the gaseous products of combustion. The adjustment of the position of this damper is effected by means of a screw *f,* which passes through the cross-piece *b,* and takes into a nut affixed to the damper. It will be obvious, however, that the

same object may be attained in a variety of ways, equally efficient, though not perhaps more economical.

Fig. 3, represents, in vertical section, a modified arrangement of the invention; and fig. 4, is a front sectional diagram, shewing the flue contracted by brickwork. In this arrangement, the damper *c*, is shewn as a flat plate, and supported by a ledge or by bearings at the upper edge of the stove. It is retained in its position by means of an adjusting screw *f*; and a shoulder of brickwork is provided for it to rest upon at *g*, when the flue is required to be closed. The damper consists of a flat plate; but, by its inclination, and by the shoulder of brickwork, an inclined passage will be formed for the passage upwards of the smoke and gaseous products of combustion; and it will be evident that a vertical downward current of wind would be wholly or in great part deflected by the damper.

When it may be thought desirable, the patentee applies to the top of the chimney, or to the chimney-pot, the contrivance shewn at fig. 5, whereby the ventilation of chimneys and flues will be greatly assisted during gales of wind, or while shifting currents prevail.

The peculiarity of this construction of wind-guard is, that, while it offers no interruption to the free passage upwards of the smoke, it will allow the wind to enter at any point of the compass, mingle with the smoke, and carry it off through side openings, or up the central channel, and thereby produce a partial vacuum in the chimney. As this improved wind-guard possesses no moveable parts, it will not be liable to get out of order by rust or decay. It is composed simply of two funnel-mouth tubes *a*, *b*,—the one inverted over the other, and forming together an annular recess in the guard. The funnel-mouth of the lower tube *b*, is pierced with holes *c*, *c*, to allow of the passage through the guard of currents of air, which are guided into these openings by means of the overhanging lip of the tube *a*. The air that enters the wind-guard will have a free vent out at the side, and, by thus passing across the top of the chimney, an accelerated tendency will be given to the smoke to rise and make its exit from the chimney.

The patentee claims, as his improvements in regulating the draft in chimneys or flues, First,—the mode, hereinbefore described, of forming a channel (the capacity of which may be increased or diminished at pleasure) for the escape of the ascending smoke and gases of combustion, and of providing for the deflection of any current of air that may pass down the chimney or flue, and, by that means, preventing the egress

of the air into the apartment. Secondly,—the construction of wind-guard, as above described, for preventing the currents of wind from interfering with the escape of the gaseous products of combustion from the chimney or flue.—[*Inrolled November*, 1852.]

To WILLIAM PIDDING, *of the Strand, in the county of Middlesex, Gent., for improvements in the treatment, manufacture, and application of materials or substances for building purposes.*—[Sealed 8th December, 1851.]

THE patentee states, that he makes bricks, slabs, blocks, tiles, pipes, or other forms or shapes, from combinations of broken stone, scoria, muriate or acetate of alumina, mineral earths, fluxes, wood or sawdust, coal, coke, papier-maché, naphtha, vegetable fibres, pitch, glue, gutta-percha, and other articles possessing the requisite properties; and, in order to effect his object, he combines several of the above articles, or any one of the above articles, with cement, which may be prepared according to any of the methods heretofore in use; or cement, prepared as hereafter explained, may be employed. The patentee also proposes to veneer blocks, slabs, bricks, or other forms (made according to this invention), when desirable, on one or more of the edges, faces, or ends thereof, with slate, stone, marble, or other suitable substance, and to cause such veneers to adhere thereto by certain cements, hereafter described. He likewise takes ordinary bricks, made of inferior materials (such as place-bricks), or bricks composed of the materials above enumerated, and covers or coats them with pipe-clay, porcelain-clay, or any other clay of a superior nature, which, when glazed, will make them appear to be composed of solid porcelain, or white or other colored clay: the clay is prepared with about twenty per cent. of soda-ash or sulphate of soda; and it is applied to the bricks either before or after they are dried or burnt. The patentee says, "I also improve the appearance of bricks, tiles, slabs, or other figures or substances, by coating or facing the same with cement;—or I take sulphate of alumina, and deprive it of its water of crystallization, when rendered semi-fluid by heat, and press them into a mould of the shape required; I then saturate them with silicate of potash, and subsequently subject the bricks to a great heat; and I make cases of thin metal, which, on being placed together, will form the article to its desired shape. I sometimes steep the sulphate of alumina in resin, or any bitu-

minous substance, when desirable, for the better effecting the adhesion of the substance from which the bricks, slabs, or other building materials are composed."

In order to render bricks and other building materials more durable, firmer, and better fitted for sewers, canal-beds, and other places where complete imperviousness to moisture is required, it is proposed to prepare a composition, by taking finely-ground or precipitated silica, with about one-fourth of its quantity of soda or potash, and subjecting the mixture to such a temperature as will cause it to fuse; then to varnish the bricks and other building materials with any common varnish, and apply the composition thereon as a coating; and, finally, to re-fuse or char the same. If it is desired to have the bricks of any particular color, mineral coloring matter is to be mixed with the composition. When only a plain or colored glaze is required to be applied to the building materials, a quantity of plain or colored glass is reduced to powder and applied to the surfaces of the bricks or other materials, which have been previously varnished; and then by fusing the adhering glass, a crystal coating is given to the bricks.

The new cements, used for the purposes above-mentioned, are as follows:—A cement is prepared by combining 20 per cent. of burnt sulphate of alumina, 70 per cent. of burnt sulphate of lime, and 10 per cent. of finely-pulverized or precipitated silica;—borate of soda may be used instead of and in the same proportion as the alumina. In manufacturing cement, the patentee takes half a ton of gypsum (sulphate of lime), and burns the same for about two hours, to drive off the water of crystallization; he then permits it to get cool, and, having prepared a solution of sulphate of alumina, in the proportion of 3½ oz. of the same to one gallon of water, he saturates the sulphate of lime therewith; after which, this composition is placed in a kiln, and subjected to a white heat for some hours; and when it is in a fit state, it is reduced to an impalpable powder, and about 10 per cent. of finely-pulverized or precipitated silica is mixed therewith. Finely-pulverized silica is obtained by burning flint-stones until they attain a very bright red color; then removing them from the furnace, and allowing them to cool down a little by exposure to the air (say from 5 to 20 minutes); and, finally, pouring cold water thereon, in sufficient quantity to disintegrate or separate the particles,—taking care so to regulate the quantity of water, that, while it effects this object, it will not cool the flint-stones so much as to prevent the same being dried by the caloric which they should still retain. Precipitated

silica may be obtained by the use of hydrofluoric acid, as is well known.

Another cement is produced by taking silica, prepared by either of the above processes, and mixing it, when dry, with linseed oil or common driers, or with linseed oil and driers, in the proportion of about nine-tenths of silica to one-tenth of linseed oil and one per cent. of driers.

The patentee also makes bricks, slabs, tiles, pipes, pillars, steps, mantel-pieces, and other articles, by burning coal to coke in a mould,—adding thereto any of the cements or varnishes above mentioned. He likewise mixes coke, charcoal, cinders, or anthracite, with coal, in the state of particles about the size of a pea, in proportions dependent upon the nature of the coal; "or, instead of coal, any carbonaceous material may be used or substituted for and used with the coke and the before-named materials." The patentee states that, when it is found desirable, he uses with the coke and the other above-named materials, any of the matters before mentioned,—such as vegetable fibres, pitch, sawdust, &c.; whatever be the component parts, the mixture is put into moulds and subjected to moderate pressure; and the moulds are placed, surrounded with sand, in a furnace, the temperature of which is gradually raised to a red or even to a white heat, and kept at that heat for a time varying according to the use to which the brick or block is to be applied, or the size or composition thereof. He also combines any of the materials before mentioned with gutta-percha or marine glue, in order to obtain light and impervious materials for building purposes generally, and for breakwaters, and ships or other vessels.

In conclusion, the patentee states, that he does not lay claim to any of the above-named articles or substances separately; but he claims the combinations of materials, to be used for the purposes above described.—[*Inrolled June,* 1852.]

To Alfred Vincent Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for an invention for preventing the incrustation of steam-boilers; which invention is also applicable to the preservation of metals and wood,—being a communication.*—[Sealed 15th April, 1852.]

This invention refers to the manufacture of a compound to be applied to metallic and ligneous surfaces, for the preservation of the same under varying circumstances. One of the

uses to which the compound is to be applied is as a preventive to the formation of a hard incrustation upon the inner surfaces of steam-boilers.

In order to prepare this compound (which has been designated after the inventor, as "Sibbald's metalline compound,") take of tallow or suet, one pound; graphite, or blacklead, finely pulverized, one pound, and charcoal, finely pulverized, one-eighth of a pound. First melt the fat, and then add the other ingredients, which are thoroughly incorporated with it by stirring. To render the mixture more fluid, so that it may be spread more easily over the surfaces to which it is to be applied, oil or gas-tar may, with advantage, be mixed with it, in the proportion of one gill to the quantities of materials above specified.

In using this compound, it is first warmed, and then applied, by means of a brush, or other suitable means, to the whole interior of the boiler, which may also be slightly warmed, to facilitate the operation. When applied, it dries almost instantly, and forms a coating, resembling in appearance a coat of ordinary black paint. If the boiler be foul, the compound is to be applied directly upon the incrustation; and, after using the boiler for a few days, it will be found that the compound has so thoroughly disintegrated and softened the incrustation that it can be easily removed from the plates by a scraper or wire brush. When applied to clean boilers, it has the effect of preventing the formation of any hard incrustation, and adheres to the plates with great tenacity and for a considerable length of time.

The compound, in addition to preserving boilers, to which it has been applied, from the injurious effects attendant on the play of the furnace fire over metallic surfaces coated with earthy deposits, appears to increase the evaporating power of even a clean boiler; it has the effect also of stopping leaks at the seams of the boiler-plates, and of preventing the corrosion of the rivets and of the metal at the joints. It is expedient, in most cases, to apply the compound as often as once in two weeks to the most exposed parts of the boiler; but the frequency with which the application should be renewed will depend upon the form of the boiler, the kind of fuel used, and the quality of the water subjected to evaporation.

The peculiarity which distinguishes the improved compound from other substances hitherto applied to steam-boilers, is the property it possesses of adhering to the boiler-plates, notwithstanding the action of the heat, and the abrasion produced by the rapid movement of the sediment

and water. This property has been found developed in the highest degree, when the combination of the three substances above enumerated has been, substantially, in the proportions stated. When the proportions are materially varied, the property which the compound possesses, of tenaciously adhering to to the boiler-plates, will be deteriorated, and the formation of a hard incrustation thereon will not be so effectually prevented.

In addition to this important application, the compound may also be used with great advantage for coating the exterior of boilers, and for defending the bed-plate and frame-work of engines from corrosion, as well as other like metallic surfaces required to be defended from rust or decay.

For ship-building purposes, the compound is also applicable; first, to protect the bolts from corrosion; and, second, to preserve the wood from decay. To protect the bolts, they should be well coated, by first covering them with the mixture, and then carefully lining the bolt-holes with it, before inserting the bolts,—which can be done by plugging each hole with a piece of the compound, and then forcing through the hole a pointed rod, somewhat smaller than the bolt to be driven; and, to ensure the effectual coating of the hole, the compound may be rubbed into the wood by the pointed rod. The joints between the timbers may be filled, by pouring into them the compound in a melted state, or caulking it in: this, however, can only be done, with a due regard to economy, when the joints are narrow. The compound should be warmed sufficiently to render it fluid, and then applied, by a paint-brush, to every part of the surface of the timbers, both before and after they are built into the frame. As the charcoal is a good disinfectant, the coating of the timber in the vessel's hold with it, will be likely to render the air more pure, and the bilge-water less offensive and injurious to health.

Metal roofs for houses, and the frame-work of mills and their machinery, and the iron about docks, piers, and bridges, may be rendered much more durable by a coating of this compound. In short, wood or iron will be protected by it from the injurious action of salt or fresh water, in all situations.

In conclusion, the patentee remarks that it is well known that many fatty substances have properties assimilating to those of suet and tallow, and may be used in place of them; but he is not prepared to state that any others are as good for the purpose. It is also well known that some substances possess, in a greater or less degree, the peculiar absorbent and disinfecting properties of charcoal; and such may be used to

replace it, in manufacturing this compound. Of the latter substances, the inventor mentions pulverized coke; but states that, not having had the opportunity of testing it, he cannot recommend its use as a perfect equivalent for charcoal, in manufacturing his compound, although it might be supposed to possess the same properties.

The patentee does not confine himself to the precise materials, nor to the proportions above-mentioned; but he claims the right to employ any of the known equivalents of the materials specified above, as well as the materials themselves so specified, and that in any proportions that will produce, substantially, the improved compound above described, and designated as "Sibbald's metalline compound." And he claims the application of the improved compound, in the manner and for the purposes above set forth.—[*Inrolled October*, 1852.]

To James Pilbrow, *of Tottenham, in the county of Middlesex, civil engineer, for certain improvements in apparatus for supplying the inhabitants of towns and other places with water.*—[Sealed 3rd March, 1852.]

The object of this invention is to regulate the supply or discharge of water for domestic and other use, in such manner as to prevent the waste or constant flow which might be occasioned by accident or wantonness. For this purpose, the patentee employs a tube or chamber containing a ball, regulated to a certain specific gravity; and he places such tube or chamber between the water-main and the tap or cock at the end of the service-pipe, by which the water is drawn for domestic use, flushing water-closets, &c.

This apparatus is represented, in longitudinal section, in Plate IV. *a*, is the tube or chamber, which is connected at one end with the main, by the pipe *b*, and at the other with the service-pipe *c*, furnished with a cock *d*. The chamber is to be of such length and diameter as to admit of a determined quantity of water, suited to the case, being delivered at each turn of the cock. It is formed truly cylindrical, with a smooth bore. The ball *e*, may be made of any suitable material; it is to be formed truly spherical; and its weight is to be so adjusted (by loading with heavier material, if required) that its specific gravity may be somewhat greater than that of the water. The ball must be made so as to pass freely through the tube or chamber; but, at the same time, there must not be too much space around it. The chamber is caused to lie at an inclination (usually one in four) with

the highest end farthest from the main; and from this elevated end proceeds the ordinary service-pipe. The proportions, form, or arrangement, may be modified,—the principle remaining the same by which the object may be accomplished: for instance, the chamber may be placed vertically, and the ball act either by its gravity or buoyancy.

If there is no leakage or draw upon the pipe, the ball will be at the bottom of the chamber; but if the cock is opened to draw off water, or the pipe should burst, or the water run to waste, from any cause, the ball will gradually ascend, until the quantity of water which the apparatus is intended to deliver has been discharged: when this has taken place, the ball will have reached the top of the chamber, and closed the aperture communicating with the service-pipe. The delivery of water will therefore cease; but on closing the cock, the ball will return to the bottom of the chamber, by reason of its specific gravity being greater than that of the water; after which a further discharge of water may be effected. A very minute leakage must be allowed between the ball and its seat, when it is at the top of the chamber, so as to place the pressure before and behind the ball in equilibrium, when the cock is shut, or the ball might not descend.

The patentee states, that he makes no claim to the exclusive use of tubes or balls, except as applied and adapted to and for the prevention of wilful or accidental waste of water, as described. But he claims the use of any tube or chamber with any ball, or other similar apparatus, to be in any way connected with the mains or water service-pipes, whereby the waste, or constant flow of water, from accident or wantonness, may be checked or prevented.—[*Inrolled September*, 1852.]

Scientific Notices.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

(*Continued from page* 51.)

The following paper, by Mr. William A. Adams, of Birmingham, was then read:—

On improvements in the construction and materials of railway waggons.

The improvements described in the present paper consist principally in the substitution of wrought iron for wood in the construction of the under-frame of railway waggons.

In the commencement of 1851, the attention of the writer was directed to the construction of a large number of waggons for the conveyance of coal, which were to be hired for a term of years, and in which, consequently, the desideratum to be aimed at was, the construction of such waggons as should commercially be the least costly in maintenance, and at the same time the most lasting in ultimate duration, with due regard to first cost.

In a former paper, the writer brought before the Institution the question of the substitution of wrought-iron of various sections in place of wood, in the construction of the rolling stock of railways, with the view to economize weight. A careful consideration of the subject, with the practical and scientific aid of Mr. W. P. Marshall and Mr. E. A. Cowper, has enabled the writer to produce waggons with iron under-frames and stanchions, of a simple construction, and at the same time at only a trifling excess in cost, as compared with the usual wood-framed waggons.

These waggons have been in daily work for twelve months, and about 500 of this construction are now working on the Taff Vale Railway, the Monmouthshire Railway, and the London and North Western, and Midland Railways; and so far as experience shews at present, they are more economical in maintenance than the usual wood-framed waggons, and give promise of lasting longer.

The waggon to be described in the present paper is of a somewhat different class to the waggons first constructed; as they were adapted for discharging coals at a shipping port by tailboard doors, and the present waggon discharges the coal at the side; but the construction of the under-frame is essentially the same. The tare or dead weight of this waggon, to carry 6 tons, with ordinary wheels and axles, is 2 tons 19 cwt.; and the tare of waggons of precisely the same class, constructed by the writer with the same wheels and springs, is 3 tons 6 cwt.;—the iron-framed waggon being 11 per cent. lighter.

The soles and head-stocks are constructed of the larger frame-iron, which is 8 inches deep, $4\frac{1}{2}$ inches wide on the bottom flange, and 13-32nds of an inch thick: the weight is 20 lbs. per foot. The section of the frame-iron is designed according to the principle discussed in the former paper, so as to obtain, with the least weight of material, the greatest amount of strength under the particular circumstances to which it is subjected: the mass of metal in the section is situated at the three extreme points, vertically and horizontally, to afford the greatest strength; and the ends are thickened to 11-16ths of an inch at the top, and 13-16ths of an inch at the bottom. This frame-iron is rolled in a similar manner to ordinary angle iron. The corners of the frame are mitred, being sawn cold by a machine set at an angle of 45°, which ensures truth in the joint. On the under side the corners are secured by a plate 5 inches wide by $\frac{3}{8}$-inch thick, fixed with three $\frac{3}{4}$-inch rivets at each end. The top of the frame-iron is secured by a knee $2\frac{1}{4} \times \frac{5}{8}$ inch, fixed with three $\frac{5}{8}$-inch rivets on the side, and two at the end.

Below this the corner is further secured by an angle-iron knee $3\frac{1}{2} \times \frac{1}{2}$ inch, fixed to the side with two $\frac{5}{8}$-inch rivets, and to the end with one rivet,—the other hole taking one of the bolts of the buffer-block. A little draw is given to all the rivet-holes, by which means the two pieces of frame are forced together at the corner, making a secure and rigid joint.

The cross-bearer in the middle of the under-frame is made of T-iron, 6×3 inches, and $\frac{5}{8}$-inch thick; and it is notched at the ends, to fit over the bottom flange of the frame-iron, to which it is secured by two $\frac{1}{2}$-inch rivets through the bottom, and an angle-iron knee at the side. The cross-bearer and head-stocks, where weakened in the centre by boring for the draw-bar, are flitched on each side by two $5 \times \frac{3}{8}$-inch plates.

The diagonals, four in number, are of fir, 11×3 inches, laid flatways; their outer ends abut against a piece of 2-inch angle-iron, rivetted to the head-stocks; and they rest upon the lower flanges of the frame-iron and of the cross-bearer in the centre,—being packed with fir packing to bring the upper side of the diagonals flush with the under side of the floor.

The floor is of fir, $7 \times 2\frac{1}{2}$ inches, laid longitudinally; and it is fitted tight inside the frame, flush with the top of the frame-iron, abutting against the thickened top edge of the frame, so as to form a very strong and rigid bracing to the frame. The floor rests upon fir-packings at the ends and centre, and is spiked down to the four diagonals. It is to be observed that one important advantage in this method of flooring is, that the floor forms an entire panel, bracing the under-frame in all directions, and materially assisting the end resistance of the frame at the buffer-blocks.

The buffer-blocks are of elm, and fixed by three $\frac{3}{4}$-inch bolts, with heads inside, and nuts recessed in the face of the buffer-block, for the convenience of tightening up when they loosen in work.

The axle-guards are two pieces of plate-iron $\frac{5}{8}$-inch thick, and fixed with four $\frac{3}{4}$-inch rivets through each leg. These guards being fixed with short rivets, measuring but 1 inch in length between the heads, a perfectly firm job is produced; and none of the rivets have been found to loosen in work, with the exception of one or two cases, where the rivet-heads have broken off from imperfect workmanship or material.

The waggon is mounted on the improved springs that were brought before the Institution by the writer in a former paper, which reduce the total weight 148 lbs. in the set of four springs, and the expense proportionally, with the same extent of elastic action as the ordinary springs. The spring-shoes are of cast-iron, fixed with a $\frac{5}{8}$-inch bolt to the bottom flange of the frame-iron, and prevented from turning round by a lip at the back, fitting against the frame.

The stanchions to support the ends are made of tramway-iron, $3\frac{1}{2} \times 2$ inches, and are fixed to the frame by two $\frac{3}{4}$-inch rivets. A

small cross-bearer of hard wood is fixed between the frame and the diagonal, to carry the side-knee.

Drawings of the improved waggon and of an ordinary wood-framed waggon, of the same size and class, were exhibited. The soles and head-stocks of the latter are of oak, $12 \times 4\frac{1}{2}$ inches, mortised together, and secured by transverse bolts through the entire frame. The floor is laid crossways upon the soles. With the same height of buffers, this waggon carries the load $6\frac{1}{4}$ inches higher than the iron-framed waggon.

The objects aimed at in the construction of the iron-framed railway waggon described above, are—First, increase of durability, and consequent economy in the expense of maintenance, by the substitution of iron for wood in those parts that are subjected to constant strains and concussions, tending to rack the joints and make them work loose. In wood-framing, this action exposes it to great injury, from wet penetrating the joints; and the wood is liable to be shaken and split; but in the iron-framing the joints are fitted, iron and iron, with very short bolts and rivets, and are as rigid and durable as boiler-work; and the iron, when protected from oxidation by paint or tar, is of great durability, remaining nearly as sound as at first, after such a number of years' work as is the ordinary limit of the work to be got out of a wood frame.

The second object is, diminution of weight in the frame, and consequent economy in the dead weight to be conveyed and the expense of locomotive power. This reduction of weight amounts to 11 per cent., and the resulting economy is an important consideration, as a proportionate increase of load can be conveyed at the same expense of locomotive power.

Mr. H. Wright remarked that he had several thousand waggons at work on the North Staffordshire and other lines, many of which were made with iron framing, but the greater number had wood frames; and he found that there was a greater expenditure in the repairs of the iron-framed waggons. The greatest increase of expense was mainly in the failure of the bolts that fixed the axle-guards, which get sheared off by the sharp edges of the iron-plate, from the rough usage to which the waggons were subjected in shunting about at stations; but in wood-framed waggons, the elasticity of the wood saved the bolts from breaking with a sudden blow. The waggons got seriously injured by the blows that the wheels received, by being run against the stops fixed at the ends of sidings; and this made the fixing of the axle-guards an important matter.

Mr. E. Jones thought that one of the greatest sources of injury, in knocking about waggons on railways, was from the want of spring-buffers; they should all have spring-buffers at one end, and the extra expense would be amply returned in the saving of injury in wear and tear.

The Chairman said that he agreed in the opinion that all railway stock should have spring-buffers; it would cause a great saving

in the expense of repairs, and greatly increase the durability of the waggons: but if only one end of each waggon was furnished with spring-buffers, the dead buffers of adjacent waggons would frequently be placed together, which would be as bad as if there were no spring-buffers. To carry out the principle properly, there must be spring-buffers at both ends.

The following paper, by Mr. Paul R. Hodge, of London, was then read:—

On a new self-lubricating axle-box for railway engines and carriages, and a self-acting spring crossing point.

No part of the machinery of a railway requires constant lubrication more than the axle journals of locomotives, tenders, and carriages; as the heating of one journal in the whole train is sufficient to produce the most serious results, not only in delaying the traffic, but endangering the lives of the passengers in the train. Notwithstanding the great attention this point has received, scarcely a train passes over our roads (in the summer more particularly) but some one or more of the axle-journals heat. The writer was induced, through what he had experienced of the difficulties attendant on the use of grease as a lubricator, and from what he knew of the use of oil in the United States, to communicate with the inventor of the best lubricating box in that country, knowing that the difference of cost of lubricating was more than one half in favor of oil with a proper box. He obtained a patent in this country for the inventor; and on application to Mr. J. E. Mc Connell, of the London and North Western Railway, a trial of the axle-box was at once made on some of their carriages.

On no railway in the United States is grease used as a lubricator. Many patents have been taken out in that country for axle-boxes; but the plan now brought before the meeting seems to be preferred, and is universally adopted. The average distance that carriages run there, before any additional oil is supplied to the boxes, or before the journals and brasses are examined, is 8000 miles. This fact has been fully corroborated by the working of these boxes on the London and North Western Railway. The first boxes were applied to the tender of No. 182 engine, which was immediately put on to the most trying work, during hot weather, sometimes running express trains at the highest speeds, and at other times at the worst possible work, ballasting; and yet, after running 6000 miles in four months, without any additional oil, the journals and brasses were in as perfect a condition as when new.

Fig. 1, in Plate IV., exhibits this axle-box in longitudinal section. A, is the axle; B, the journal; C, a wrought iron collar, shrunk on to the axle, having a groove turned into it, to receive the piece of leather D; and E, is the brass bearing. F, is the upper chamber, which is filled with cotton waste, flax, sponge, or any other capillary material, to retain and pass the oil up to the journal; and G, is the lower or secondary chamber, for the reception of the dirty

oil, which finds its way down the space at the back of the bridge wall, and can be removed by unscrewing the screw J. H, is an iron plate, bolted to the back of the box, to keep the leather flange D, to its place; I, a covering plate, bolted on the front of the box; and K, is the hole for supplying oil, closed by a screw.

The results of the trial of the new axle-boxes in the tender No. 182, have been officially reported as follows, to Mr. McConnell, by his assistants:—The axle-boxes have, up to 20th September last, run 5743 miles;—the bearings have been examined, and are found in a very satisfactory state. No oil has been supplied since the first day of running, four months previously; 10 quarts of oil have been supplied to the boxes altogether; and 5 quarts have been drawn off during the time from the bottom chamber, which is still good oil for screwing, drilling, and other ordinary work: the oil remaining in the boxes is considered sufficient, without more being added, to run at least from 3000 to 4000 miles more. The journals and brasses are wearing beautifully, with faces as though polished in the latter; and it is found, that the usually great wear endwise does not take place on the brasses, as in the ordinary boxes using yellow grease or tallow. The cost of lubrication is greatly reduced, as appears from the following account of the comparative consumption of the above tender with the new axle-boxes, and another tender exactly similar, except that it was fitted with old boxes on Normanville's plan, using tallow,—both tenders having run the same distance, 6000 miles, under the same circumstances of trains, and the weather being dry and dusty nearly the whole of the time.

NEW AXLE-BOXES.	*s.*	*d.*
Oil put into the boxes at starting, 10 quarts, at 9d..	7	6
Credit by 5 qts. drawn off from the bottom chamber, at 6d.	2	6
Actual cost of oil	5	0
Cotton waste, 4 lbs., at 2d.	0	8
Leathers, 4½, at 1s.	4	6
	10	2

Actual cost per day, 1·54*d.*, or 1½*d.* per day.

OLD AXLE-BOXES.

Tallow required per day, 2 lbs., at 4½*d.* or..	9*d.* per day.
Saving per day on the 6 new boxes	7½*d.* „

	Cwt.	Qrs.	lb.
Weight of the 6 old axle-boxes	3	1	0
Weight of the 6 new axle-boxes	1	2	20
Saving in weight of the 6 new axle-boxes	1	2	8

The advantages of this axle-box over those now in use are, firstly, the perfect exclusion of dirt or grit from the box by means of the leather and wrought-iron collar. Secondly, the certainty of constant and never-failing lubrication of the journals and brasses by means of the capillary medium, placed in a separate chamber, and detached from the back of the box by means of the bridge wall; so that the hydraulic lead of the oil can be carried much higher than the joint of the leather and collar; allowing the upper chamber to be full of oil, if necessary, while it is impossible that any oil can leak out at the back. Thirdly, the provision of a secondary or under chamber for the dirty oil to drop into, from which it is drawn off, refined, and again returned to the upper chamber; or is used in the machine shop for drilling, cutting bolts, and many other purposes, and is equally good as new oil.

Self-acting point for crossings.

This crossing-point, commonly called the "frog point," is generally used on the railways of the United States.

Fig. 2, is a plan view of the simplest construction of the spring-crossing. A, is the main line of rail, and B, the cross line. The crossing-point C, is the same as usual; but the wing-rails D,D, are each moveable on a stud at the end, acting like switches; and two pins are fixed to them on the under side, passing through slots in the bed-plate E. An India-rubber ring F, is passed round these studs, which draws them together, and keeps the moveable tongues D,D, in close contact with the crossing point; so that the rail presents an uninterrupted surface for the trains running through either line; the flanges of the wheels opening the tongue on the opposite side, which closes again directly they have passed.

Fig. 3, is a plan view of another construction of the crossing. In this, the India-rubber spring acts as a buffer-spring, being put upon a horizontal spindle F, which passes through two studs on the moveable tongues D, D, and has a washer at each end to confine the India-rubber buffer-springs, which are constantly pressing the moveable tongues against the fixed crossing-point.

The main feature in both of these arrangements consists in having a complete uninterrupted tread for the wheel whilst passing through the crossing, at the same time ensuring a certainty of action in whichever direction the train is passing.

Mr. Mc Connell said, that he believed the statement in the paper was correct, about the results of the trial he had made of the axle-box. There was a perfect exclusion of dirt from the journal, and the keeping it constantly in contact with the oil was an important advantage. He was satisfied they must, ere long, abandon grease for oil: there was a great loss of power from defective lubrication of the carriage and waggon journals in cold weather, as there was no lubrication in action on first starting, until the journals got

heated, and then they were liable to get too hot, and the grease ran away, and was scraped off the outside of the boxes, and put in again, mixed with grit, at the stations.

Mr. Lea, of London, mentioned a new material for lubrication, that he was bringing into application; it had been tried some years since by Mr. Ramsbottom, with very satisfactory results; but further trials had been suspended till now, from difficulties of the inventor, who was now dead. This lubricating substance consisted of a peculiar semi-fluid composition, applicable to the present axle-boxes; oil was the basis of the composition, but thickened with India-rubber and other materials; it had an affinity for the iron bearing, which prevented the displacement of the material from the rubbing surface. The manufacture of the material was not expensive, costing only 4*d.* per lb.; and when charged at 16*d.* per lb., it had been found, in the trial made, that there was a very considerable saving in the cost of lubrication, compared with the ordinary grease or tallow. There was a great advantage in this plan, from requiring no change in the present axle-boxes. No ordinary pressure in the bearings could squeeze out the lubricating material: therefore it remained between the surfaces, preventing contact, and, consequently, preventing any heating by friction.

Mr. E. Jones observed, that the use of a spring crossing-point was not new in this country; it had been in operation, for six years, on the Great Western Railway; also on the Bristol and Exeter and the South Wales lines; and fourteen years since he remembered something of the kind in use on the Hartlepool Railway. He had made several hundreds with flat steel springs, originally of his own invention, at Bridgewater, for those lines. A $2\frac{1}{2}$-feet spring was used for crossings of 600 feet radius, and a $3\frac{1}{2}$-feet spring for 900 or 1000 feet radius, according to the curve. The springs were $2\frac{1}{2}$ inches wide and $\frac{3}{8}$-inch thick, tapered to 3-16ths of an inch. He gave a sketch of the spring-crossing (see fig. 4). He had tried some with India-rubber springs, but did not find them so lasting as steel springs. The crossings were made safe in any case, though broken, by the tongues being prevented from rising or getting wrong, even if the bolt broke or came out, as the moving tongue was bound down by strong clips at each end.

The Chairman said, he remembered that on the Stockton and Darlington Railway, spring crossing-points were tried at one time, but were abandoned, from getting knocked to pieces with the increase of speed and weight in the engines.

Mr. Adams enquired about the working of Normanville's and other oil-tight grease boxes,—what was the result found in working? He observed that an axle-box had been brought out some time since by his father, for a similar purpose, with a leather collar, to prevent the waste of grease or oil.

Mr. H. Wright said, that Normanville's first axle-box was intended to feed in front, with the supply of grease below the journal, and filled up close to it. But the grease was found to lose its

nature, and get hard below the journal; and the box was then improved by keeping the grease in a chamber above, as in the ordinary boxes. He had known several kinds of oil-boxes, but they were all liable to the spilling of the oil from side blows and oscillations. The employment of the cotton waste in the axle-box, described in the paper, he thought was decidedly a good plan to prevent the oil from spilling over; and he enquired the result that had been found in the trial on the London and North-Western Railway?

Mr. Mc Connell replied, that there appeared to be no spilling or loss of oil, and the dust and grit were effectually kept out of the box. The oil drawn off from the bottom chamber was very black and thick, and not suitable to use again in that state, though it might be fit for drilling purposes, &c.; but after being properly purified, it was very good for lubrication again. There was a bridge at the back of the axle-box, just high enough to prevent the oil from flowing off: the oil did not come into contact with the leather joint, which was only to prevent the entrance of grit and dust.

Mr. E. Jones said, he remembered that on the North Union Railway, many years since, Mr. Williams had tried a collar or picking-up ring on the middle of the journal, which dipped into cotton waste saturated with oil, whilst revolving; continually taking up a supply of oil for lubricating the journal.

Mr. Chillingworth remarked, that there was a plan of lubrication with a cork ball, about one inch diameter: two of these balls floated on the surface of the oil, rolling against the journal to distribute it thereon. He believed it was a French invention, but did not know the result of its application.

Mr. Mc Connell said he was not acquainted with that plan. The leather in the new axle-boxes was not found to wear away, and appeared likely to last a long time, as there was no pressure or strain upon it; the leather was not bent, but simply fitted easily into the groove in the iron collar, which was shrunk on to the axle.

Mr. H. Wright observed, that the leather would, probably, wear the iron away before it was was worn away itself. He had found it necessary, in Normanville's axle-box, to increase the surface of contact, by a longer bearing of the leather collar on the axle, to allow for the wearing away of the iron by the constant grinding action with the particles of grit.

Mr. Allan remarked, that he had used sponge in the axle-boxes of engines for the last ten years, and found the results very satisfactory. They found that the consumption of oil, which was previously six to eight quarts, for the 100 miles trip between Birmingham and Liverpool, was now reduced to one quart, partly by the introduction of sponge in the axle-boxes of the ten bearings of the engine and tender.

The Chairman enquired whether the sponge was placed below,

to catch the oil falling from the bearings? and was the oil fed from above, as usual?

Mr. Allan said, that was the mode of application: the sponge wiped up the oil, thus preventing the loss of the oil that would have dropped from the journal, and keeping the journal constantly oiled smoothly over.

Mr. Mc Connell thought that sponge would be liable to get hard with a hot axle, and that the cotton waste would be a better plan. In the new axle-box, the great improvement, he considered, was in having the reservoir of oil below the journal, instead of above: this appeared to be the best mode of application, as any grit or impurities in the oil settled to the bottom, and were prevented from coming in contact at all with the journal, by that arrangement, which could not be entirely prevented when the reservoir was above the journal. The lower separating chamber, for the waste oil, was also an important improvement, keeping up a constant gradual separation of the impure oil, and affording a great means of economy, in using the oil over again, after being purified. The leather collar was a very effective and simple contrivance to exclude the grit and dust, which were a great source of expense and injury in the ordinary axle-boxes.

Mr. Slate asked, what was the comparative economy of the American axle-box and Mr. Allan's plan? In the latter plan, there was consumed one quart of oil for 100 miles,—but in the other there was said to be five quarts for 6,000 miles, or one quart only for more than 1,000 miles.

Mr. Allan remarked, that the one quart of oil that he had mentioned was used for all the bearings, moveable joints, &c., of the engine and tender,—not for the axle-boxes alone, as in the trial of the new axle-box; and he had no means of knowing what proportion of the whole was consumed by the axle-journals.

Mr. Forsyth, of Wolverton, remarked, that one circumstance had not been mentioned, in the description of the new axle-boxes, tried on the London and North-Western; the cotton was rammed in tolerably tight from the front,—filling the boxes up solid, except against the ends of the axles. The cotton was put in dry, and it became gradually saturated, by pouring in oil, from time to time, at the top hole: it would continue to absorb oil for several days. The surface of the cotton waste, when examined, after running the 6,000 miles, was like a metallic polished surface next the journal; but still it was found saturated with oil, close up to the surface of contact. The leathers were cut straight up, $\frac{3}{4}$-inch from the axle, but not bevilled, to get them into the groove of the iron collar; but no leakage was found to take place, as the cotton was not over-saturated, and the oil never came in contact with the leather so high up as the cut.

INSTITUTION OF CIVIL ENGINEERS.

December 14th, 1852.

The discussion on Mr. Rawlinson's paper, "*On the drainage of towns,*" was again resumed, and occupied the whole of the evening.

It was contended, that the absence of a clear understanding of the subject before the meeting had arisen from certain doctrines having been promulgated, in the published Reports of the Board of Health, almost amounting to the prescription of a stereotyped mode of treating all cases of drainage, however various and peculiar the local circumstances might be. This assumption, by a public board, was strongly combatted, and it was shewn, that to the judgment and experience, alone, of the engineer, could safely be intrusted the design and execution of works of such importance to the community as the sewerage and drainage of cities and towns, in no two of which the circumstances could be identical.

The decrease of mortality, resulting from a general improvement of the sanatory condition of towns, was fully admitted; but it was shewn that the published statements were exaggerated, and that, when critically examined, they would be found to exhibit untenable inferences and impossible results.

It was admitted, by unquestionable practical authorities, that mere abstract principles did not hold good, in questions of the sewerage of towns, where so many local circumstances and domestic occurrences interfered with the perfect working of even the best designed general plan. There was no doubt, that if pipe-drains could be made sufficiently large and strong, and manageable, within a certain cost, they would be as good as brick sewers; but under the present circumstances, they were only fit to form the connections of houses, courts, and other small localities, with the main sewers; which should be constructed of brick, of such dimensions as to admit of easy internal inspection and repair, and be of such form (except where the flow of water was at all times considerable) that the radius of the curved bottom should be such as to gather a small supply of water into a sectional area, affording the same hydraulic mean depth as in a pipe-drain, of a diameter merely adapted to discharge the minimum flow. The removal of obstacles, or accumulations, from the main sewers, by manual labour, was shewn not to be more dangerous than the ordinary employment of most working engineers, or of men engaged in the execution of constructive works, and that it was a mere exhibition of false sentiment to put forward such an argument in favor of the introduction of pipe drainage.

The system of combined back drainage was shewn to be decidedly objectionable; and that even as tributary drains, the pipes should only be used when they connected directly with main or arterial sewers.

It was wrong to call in question the results of Mr. Roe's great experience, although opposed to the views of a public board; as that board had deemed the records of the observations of sufficient value to warrant their paying a large sum for the possession of Mr. Roe's information.

The statement of a greater amount of velocity of flow in, so called, smooth pipes, was proved to be a fallacy and a delusion; the correctness of the formulæ of De Buat, Eytelwein, Prony, and Poncelet was maintained, and the close approximation of the results of actual experiments, on a large scale, with these formulæ, was exhibited in a tabular form; and it was shewn, that on a repetition of the experiments made for the Board of Health, the incorrectness of the published results was indisputably demonstrated.

It must be admitted that permanency and durability should be the first consideration of an engineer in designing drainage work; and it was well known, that, at inclinations mentioned by the author of the paper, the abrading action of grit on the bottom of pipes, or even on ordinary bricks, would soon wear them away: therefore thin pipes and hollow bricks were not to be used for main sewers in great thoroughfares, or where tearing up the streets would be prejudicial to public convenience, or cause danger to the adjoining buildings.

An unnecessary difficulty, of great magnitude, had also been imposed upon engineers, in consequence of the apparent determination of the Board of Health to render sewerage works subservient to their impracticable schemes for the distribution of liquid manure, by pipes and mechanical means, over great extents of country, not merely adjacent to, but at considerable distances from the towns intended to be drained. The proposition of a main of sewage pipe, from Brentwood to Ipswich, was quoted as an instance in point.

The plan now in course of trial at Leicester, under Mr. Wickstead, for separating the fertilising matter, in a solid state, from the sewage water, by which the latter was deprived of its noxious properties, was mentioned with praise.

The practice of constructing the main sewers at Liverpool, by cutting the sandstone rock to a curve, so as to form a natural invert, and arching over the top with bricks (using pipe-drains only for separate feeders from each house and court, as the case might be) was fully described and stated to be very successful.

The selection of proper outfalls was admitted to be a chief consideration in all designs of sewerage; and pumping was demonstrated to be open to serious objections, on the points of cost and liability to flooding, in case of extraordinary rain-fall, or of the derangement of the machinery, which must, of necessity, be in duplicate, as the pipe-drains could not be used, like large sewers, as elongated reservoirs, during such a stoppage as that of sixteen hours out of every twenty-four hours, which actually occurred, by

the action of the tide, on many of the sewers of the south district of London.

It was admitted, that the Board of Health could not maintain the asserted superiority of the small-pipe drain-system, even to the extent still attempted;—the present doctrine being not to construct any drain larger than, as was alleged, would be able to relieve a district of its ordinary sewerage, without regard to the contingency of storms and the necessity of internal inspection.

It was, however, alleged, that some civil engineers had recently employed pipe-drains to a greater extent, and for purposes beyond which some of the speakers had limited their applicability. To which it was replied, that the system pursued at the Board of Health was such that no engineer could get his plans sanctioned, without adopting the prescriptions, and submitting to the dictation of that authority; and that the instances referred to were, in themselves, peculiarly, and therefore exceptionally favorable for the use of pipe-drains; but had, even in those cases, for the purpose of getting permission to execute, been carried to a greater extent than was approved by the engineers who were charged with the responsibility of the works.

January 11th, 1853.

The paper read was "*On the nature and properties of timber, with notices of several methods, now in use, for its preservation from decay,*" by MR. H. P. BURT, Assoc. Inst. C. E.

The author first examined the different species of home and foreign-grown timber, their various properies, uses, tendencies to decay, under certain circumstances, the most apparent causes of dry rot, the formation of fungi, and the action of wet and of heat; noticing the extraordinary duration of specimens of timber found in Egypt, in the ruins of Nineveh, and in the more recent monastic and castellated edifices of this country.

The chemical constitution of wood was examined in order to trace the origin of decay, and to lead to the consideration of the most efficient means of arresting it. The necessity for some efficacious and yet moderately cheap system of preserving timber was insisted on, from the great demand for railway and other engineering works, not only in Europe, but even in the East Indies; where it was found that the wood which would resist the climate and the ravages of the white ant, was only to be obtained at such distances inland, that the expense of carriage, in a country devoid of good means of communication, rendered it more economical to buy fir timber in the north of Europe, to convert it to the required dimensions, and saturate it with creosote in England, and convey it by sea to India, for the use of the railway now in course of construction in that country.

The earliest records of preserving animal and vegetable substances were traced back to the Egyptians, whose mummies were

embalmed by being boiled in hot pitch, found floating in the lakes. The linen and the timber, so preserved, gave the first idea for adapting the process to the wants of the present period, and several of the patents granted were enumerated and commented on,—the greatest space being devoted to those of Kyan, for chloride of mercury; Burnett, for chloride of zinc; Margary, for acetate, or sulphate of copper; Payne, for the use of two solutions in succession, mutually decomposing each other, and forming an insoluble substance in the pores of the wood; and Bethell, for creosote or oil of coal-tar. The last had, by its extensive employment in harbour, railway, and other engineering works, proved, that when properly executed, the preservation of the timber from decay and from the ravages of insects, might be considered complete.

January 18th, 1853.

The evening was entirely devoted to the discussion of Mr. Burt's paper "*On the preservation of timber.*"

The theory of the various processes was carefully described. The action of the solutions in water of metallic salts, such as chloride of mercury (Kyan's), chloride of zinc (Burnett's), or sulphate of copper (Margary's), was, if the mixture was sufficiently strong, to coagulate the albumen in the sap; but the fibre was left unprotected; and it being a property of albumen to render innocuous the corrosive sublimâte combined with it, the marine worm, or the white ant, would immediately attack wood so prepared. Creosote had the same effect of coagulating the albumen, whilst it gave a waterproof covering to the fibres, prevented the absorption of water, and was so obnoxious to animal life, that hitherto no instance had been adduced of well-creosoted timber having been either touched by decay, dry rot, or the marine worm; and the trials made in India shewed, that it was equally objectionable to the white ant.

The chemical products of the distillation of coal tar were described, and it was shewn that the naphthaline was essential as an antiseptic; that the process should be carried on with heated creosote, in order that this product should not crystallize in the capillary tubes of the wood; and that it would be advantageous to desiccate the timber before it was submitted to the process; for which purpose, it was proposed to dry the wood, by smoking it in an oven, whence it should be conveyed, on the same trucks, into cylinders, exhausted to the extent of 26 or 27 inches of mercury, and then saturated with heated creosote, under a pressure of 120lbs. to 150lbs. per square inch. Wood thus saturated, to the extent of 7lbs., or 10lbs. per cubic foot, might be presumed to be indestructible; as when, even by a less perfect process, such an extent of saturation had been attained, that no authentic instance of decay, or injury from worm, had ever been

adduced. Numerous specimens of wood, so prepared, that had been under ground, and in the sea, for from twelve to twenty years, were exhibited, and all were perfectly sound.

The alburnam or sapwood absorbed the creosote more readily than the heart of the timber, which could, however, be penetrated by the solution of chloride of zinc (Burnett's process), of which it was stated, that careful analysis demonstrated its intimate combination with the timber. It was, therefore, suggested that, in cases where the complete preservation of the timber was of vital importance, and expense was not a consideration, the wood should be first subjected to Burnett's process, and then be creosoted, by which combined means it would become indestructible.

It was shewn that dry wood only should be subjected to creosoting,—by that process, sapwood, otherwise almost useless, could be rendered very serviceable,—and that for piles for marine work, whole round timber should be used, because the outer portion or the alburnam, was so much more readily saturated with the oil; and this prevented the worms from making an inroad into the heart.

Timber should not be kept floating in ponds, as in London, but it should be stacked in the docks, as in Liverpool and Gloucester: when the tubes were filled with moisture, no oil could be forced into them, even by the heaviest pressure.

By returns from the Leith Harbour Works, it was shewn, that the average quantity of creosote absorbed by the timber was 57¾ gallons per load, or 577lbs. weight, forced into 50 cubic feet of wood.

Piles, 14 inches square, of unprepared timber, at Lowestoft Harbour, were shewn to have been eaten away to four inches square in four years; whilst creosoted piles, of the same dimensions, driven alongside them, were perfectly untouched: specimens of both were exhibited.

Some specimens were shewn of curious coke, produced from the pitchy residue of the distillation of creosote; it was quite free from sulphur and earthy particles, and was found to be very valuable for smelting iron, for which purpose it was beginning to be largely used near Birmingham.

It appeared to be admitted, that all the various processes somewhat reduced the transverse strength of the timber when dry; and the metallic salts were affected at the iron bolts or fastenings. The natural juices of some woods did this; and a bolt was exhibited which had united beams of elm and pitch pine, and was corroded entirely away at the junction.

It was shewn, that on some railways in the North, unprepared yellow pine had been down, as longitudinal sleepers, for sixteen years, and was still perfectly free from decay, although its natural term had expired, by being crushed under the loads constantly travelling over it. The effect of "green-heart" timber in resisting

the attacks of worms, was particularly noticed, and it was admitted, that but for its great cost, it would be extensively used.

Experiments were mentioned, that were made at the Royal Pier, Southampton, on timber prepared by various processes; and the result was, that the creosoted wood alone resisted the attack of the "terebrans" with which that water was peculiarly infested.

January 25, 1853.

The discussion on the preservation of timber was renewed, by the exhibition of specimens of timber, rendered uninflammable, by Sir W. Burnett's process (chloride of zinc). It was stated, that in the most intense fire, timber, or even linen, so prepared, could only be charred, and would never burst into flame.

The President fulfilled his promise of procuring, from Southampton, portions of unprepared, and of creosoted timber, which had been attached to the worm-eaten piles of Southampton Royal Pier, in February, 1848, below the level of high water of spring tides. The specimens shewed, that whilst the unprepared and "Payneized" timber was entirely converted, by the worm, into a mass of disintegrated fibre, the creosoted timber had not been touched by those insects. An offer was made to attach, in an identical position, specimens of timber prepared by any process, and to bring them, after a given time, before the Institution, to enable the merit of the system to be practically ascertained.

The President directed attention to the Dublin Exhibition; and Mr. Roney, the secretary, stated that the undertaking was progressing most favorably; the original size of the building would be nearly doubled, and, to meet the additional outlay, Mr. Dargan had increased his donation from £20,000 to £50,000. It was believed, that the department of machinery in motion would be quite as interesting and attractive as that in the Great Exhibition of 1851, in London. The Society of Arts had determined, that their East Indian Exhibition, and all the influence of their body, should be transferred to the Dublin Exhibition. There would also be a mediæval court, and an archæological collection, which would shew that Ireland, though of late years not progressing so rapidly as this country, was, in former times, a country possessing high attributes of civilization. There would also be a fine collection of ancient and modern pictures of every school. Mr. Roney concluded by soliciting the members to aid the Exhibition by the loan of models, whether working or stationary, and of works of art, of which great care would be taken.

The paper read was, "*On the construction of fire-proof buildings*," by Mr. James Barrett, Assoc. Inst. C.E.

The author first introduced some remarks on the use of

timber, for building purposes, referring to its injurious effects in weakening the walls of buildings, its combustibility, and its liability to dry-rot, and the ravages of insects.

The iron-girder and brick-arch system of construction was then referred to, and the evils which might result from the adoption of that principle, were exemplified by reference to the fall of the cotton-mill, at Oldham, in 1845; where the lateral thrust of one of the arches having fractured a cast-iron beam, had caused the sudden destruction of the entire building.

The paper then proceeded to describe the system of fire-proof construction, which had been, to some considerable extent, adopted, as a substitute for the usual methods of building, and as a remedy for the defects complained of. The chief objects to be accomplished were described to be, making each floor of the building fire-proof, so as to prevent the communication of fire, from story to story, avoiding all lateral thrust, or weakening effect upon the walls, securing the building from the attacks of dry-rot, giving increased durability to the structure, rendering it, at the same time, practically sound-proof; and combining these advantages, at the same time, with simplicity and economy of construction.

In accomplishing these objects, joists of wrought, or rolled iron, of an improved form, combining lightness with great strength and economy, were used; and by the employment of layers of incombustible materials, chiefly concrete, supported by, and consolidated with, the joists, a strong and solid fire-proof foundation was obtained, upon which any description of finished surface, adapted for a floor or roof, might be laid. The various parts of the structure having been minutely described, it was stated, that in point of strength, the floors, even of an ordinary dwelling-house, constructed on this principle, would, if crowded to the utmost possible extent, be loaded with only one-fifth of their breaking weight.

The various applications of the system to such buildings as Guy's Hospital, King's College Hospital, the Training College, Chelsea, and the Flax Mills, at Newry, the spans of which were considerable, were then detailed: these consisted of the use of girders of cast-iron, with minor joists of the same material; of boiler-plate girders, combined with cast-iron joists (the whole of the additions to Guy's Hospital having been built in this manner), and of boiler-plate girders, combined with rolled-iron joists. The latter method provided for every possible contingency, whether as regarded width of bearing, strength of floors, or liability to impact, or vibration; and in cases where the use of columns could be admitted, to shorten the bearings, both girders and joists of rolled-iron were employed,—this latter application referring chiefly to mills, warehouses, manufactories, and similar buildings.

It appeared, from a detailed comparative statement of the cost of different floors for domestic buildings, given in an appendix to the paper, that substantial and well-constructed timber floors were actually more costly than the fire-proof floors, finished with a surface of cement; and that the fire-proof foundation, finished with the ordinary boarded surface, was, on the average, very little more expensive than ordinary timber floors.

A comparative statement of the cost of a floor for a mill, or factory, formed in three different ways—namely, with timber; with cast-iron girders, and brick arches; and with girders and joists of rolled-iron—shewed a decided economy in favor of the latter system, as compared with cast girders and arches.

In the lobby, one of Jennings' sluice-valves was exhibited. The improvement was stated to consist in simplifying the construction, by casting the "body," and the "faucet" ends in one piece,—thus avoiding the use of bolts, nuts, and joints. The slide was first fitted, and made to work properly on the body of the valve; it was then removed, and, with two gun-metal faces, was turned, ground, and accurately fitted. The slide, through which a small hole had been previously drilled, was again placed in the valve, the two faces were introduced, and all firmly bolted together. The joints of the faces, which were dovetailed to the body, were then made with lead, or with iron cement; the bolt was removed, the hole plugged, and the valve was completed, at considerable saving of time and cost. These valves were stated to have been extensively used, under considerable pressures.

LIST OF GRANTS OF PROVISIONAL PROTECTION UNDER THE NEW LAW.

Cases in which a full Specification has been deposited.

1108. Juan Nepomuceno Adorno, of Golden-square, Gent., for improvements in the manufacture of cigars, cigarettes, and other similar articles.—December 20.

1113. Charles Pilkington, Thomas Pilkington, and Abraham Pedigor, of Sheffield, joiners' tool-makers, for an improved joiner's brace.—December 20.

1185. Francis Alton Calvert, of Manchester, engineer, for a universal ratchet-drill,—being a communication.—December 28.

Cases in which a Provisional Specification has been deposited.

979. William Quarterman, of Whittaker-street, Pimlico, for the invention of eliciting the gas concentrated in nitre and sulphur, and which is entitled a gaseous engine.—[*Dated December 6th.*]

991. Thomas Lovell Preston, of Birmingham, machinist, for a machine for making links for chains.

992. John Brown, of Charles-street, Regent-street, Gent., for improvements in machinery or apparatus for preventing the escape of smoke from chimneys, and consuming or otherwise disposing thereof.

993. Peter Armand le Comte de Fontainmoreau, of South-street, Finsbury, for improvements in the machinery for applying metallic capsules,—being a communication.

995. John Harrison, Robert Harrison, and Alexander Stewart Harrison, of Dromore, county Down, cambric manufacturers, for certain improvements in machinery used in the manufacture of textile and other fabrics.

996. John Symonds, of Glass House-yard, East Smithfield, galvanized iron merchant, and George Mouchet, of Battersea, Gent., for an improved mode of cleaning or scaling metallic surfaces.

997. William Baddeley, of Islington, engineer, for improvements in apparatus for the conversion of rectilinear into circular motion,—being a communication.

998. Donald Beatson, of Mile End, and Thomas Hill, of Southampton, for improvements in the means of propelling ships and other floating vessels.

999. Thomas Hill, of Southampton, for certain improvements in paddle-wheels for propelling ships and other vessels.

1000. James Lawrence, of Westminster, for improvements in the manufacture of projectiles.

1001. Anthony Norris Groves, of Madras, and Conrad William Finzel, jun., of Bristol, for improvements in condensing steam or vapours.

1002. Jame Spotswood Wilson, of Tavistock-place, civil engineer, for improvements in propelling.

1003. Sir John Powlett Orde, of Kilmorey House, Loch Gilp Head, in the county of Argyll, for improvements in head gear for horses and other like animals.

1004. Joseph Hopkins, of Worcester, hop factor, for improvements in obtaining a straight line parallel to the axis of the earth, or in rendering the axis of a tube or of a telescope parallel thereto.

The above bear date December 8th.

1007. William Mather, of Manchester, chemist, for certain improvements in the method of spreading medicinal compounds upon leather, to be used as plasters, and in the machinery or apparatus connected therewith.

1008. William Baddeley, of Islington, engineer, for improvements in the manufacture of metal pipes,—being a communication.

1009. William Allchin, of the Globe Steam Engine Works, Northampton, engineer, for improvements in agricultural and other steam-engines.

1010. Edmund Hunt, of Glasgow, Gent., for an improved screw propeller.

1011. Edward Thomas Loseby, of Gerrard-street, Islington, horologist, for improvements in the construction of time-keepers, and in cases to be applied thereto.

1012. Charles Greenway, of Cheltenham, for improvements in anchors.

1013. George Collier, of Halifax, for improvements in the manufacture of carpets and other fabrics.

1014. Thomas Masters, of Oxford-street, confectioner, for improvements in machinery or apparatus for cleaning knives and other steel articles.

The above bear date December 9th.

1015. John Sheringham, of Edwardes-square, Kensington, Gent., for improvements in the construction of stove-grates.

1016. Jonathan Caldwell Blackwell, of Edinburgh, accountant, for improvements in musical instruments.

1017. Alfred Thomas Jay, of Cheapside, for a safety letter-box.

1018. Thomas Abbey Smithson, clerk, and George Hall Adam, clerk, both of Kingston-upon-Hull, for an improved mode of suspending carriage-bodies.

1019. James Derrington, of Manchester, brass-founder, and John Chadwick, of the same place, book-keeper, for improvements in cocks and valves for liquids and steam.

1020. Richard Archibald Brooman, of Fleet-street, for improvements in evaporating apparatus,—being a communication.

1021. Julien Boilesve, of South-street, Finsbury, engineer, for an improved desiccating apparatus,—being a communication.

The above bear date December 10th.

1022. Thomas Boardman, of Pendleton, overlooker, for improvements in looms for weaving.

1023. William Rothera, of Hollinwood, machine-maker, for certain improvements in machinery or apparatus for manufacturing nails, screw-blanks, and other similar articles of metal.

1024. George Duncan Howell, of Edinburgh, house-painter, for improvements in ventilation.

1025. James Martin, of Prospect-row, Bermondsey, civil engineer, for improvements in the composition of artificial fuel, and in the mode of manufacturing the same.

1026. Edwin Bates, of Wellbeck-street, geometer, for improvements in brakes for railway engines and carriages.

1027. William Sorrell, of Kingsland, engineer, for improvements in furnaces and fire-places for consuming smoke.

1028. Archibald White, of Great Missenden, Gent., for improvements in apparatus for retarding and stopping railway trains.

1029. Caleb Bedells, of Leicester, manufacturer, for improvements in reels.

1030. Stephen Green, of Princes-street, Lambeth, for improvements in joining earthenware tubes and pipes.

1031. George Dixon, of Birmingham, merchant, for improvements in the manufacture and refining of sugar,—being a communication.

1032. Timothy Morris, of Birmingham, manufacturer, and William Johnson, of Washwood Heath, near Birmingham, Gent., for improvements in depositing alloys of metals.

1033. Charles Ritchie, of Hackney, for improvements in apparatus for measuring fluids.

1034. John Thomas Way, of Holles-street, Cavendish-square, Professor of Chemistry, and John Manwaring Paine, of Farnham, for improvements in the manufacture of glass.

1035. Charles Griffin, of Sydney-terrace, Milverton, in the county of Warwick, Gent., for improvements in obtaining metallic copper from its solutions formed by nature, and in the various processes of purifying cupreous ores by means of water.

The above bear date December 11*th.*

1036. Josiah Glasson, of the Soho Foundry, near Birmingham, boiler-maker, for improvements in boilers.

1037. Joseph Hamblet, of Oldbury, brick manufacturer, and William Dean, of Oldbury, agent, for an improvement in the manufacture of bricks.

1039. George Mackay, of Buckingham-street, Strand, Gent., for an improved construction of stirrup,—being a communication.

1040. George Mackay, of Buckingham-street, Strand, Gent., for an improved construction of paddle-wheel,—being a communication.

1041. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for improved apparatus for regulating the density of fluids,—being a communication.

1042. Jules Lejeune, of Auteuil, near Paris, for a new machine for washing house linen, and all kinds of textile articles that are employed in making them.

1043. Frederick Dangerfield, of Broad-court, Long Acre, lithographer, for improvements in the lithographic press.

1044. David Napier, of Millwall, engineer, for improvements in steam-engines.

1045. Henry Clayton, of the Atlas Works, Upper Park-place, Dorset-square, for improvements in the manufacture of bricks.

1046. William Henry Fox Talbot, of Lacock Abbey, for improvements in obtaining motive power.

1047. Abraham Ripley, of Philadelphia-terrace, Westminster-road, engineer, for improvements in axles for railway wheels.

The above bear date December 13*th.*

1048. James Bell, of Portobello, in the county of Mid Lothian, engineer, for improvements in railway chairs.

1049. Charles Edmond Magnant, of Paris, for certain improvements in tanning.

1050. John Nicholes Taylor, of North Shields, blacksmith, for certain improvements in ships' windlasses and other winches.

1053. Isham Baggs, of Liverpool-street, engineer, for improvements in obtaining or extracting gold and silver from their ores.

1054. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in fire-grates or fire-places,—being a communication.

1055. William Johnson, of Lincoln's-inn-fields, civil engineer, for improvements in apparatus for the manufacture of aërated waters,—being a communication.

1056. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in wind-guards or chimney-tops,—being a communication.

1057. Josiah George Jennings, of Great Charlotte-street, Blackfriars-road, brass-founder, for improvements in constructing drains.

1058. Rudolph Appel, of Gerrard-street, Soho, for improvements in anastatic printing, and in producing copies of drawings, writings, and printed impressions.

1059. Joseph Paul Marc Floret, of Paris, for an improved method of producing simultaneonsly gas-light and lime or plaster.

The above bear date December 14th.

1060. William Edward Middleton, of Birmingham, engineer, for a new or improved lubricator,—being a communication.

1061. Philippe D'Homme, of Paris, manufacturer, for certain improvements in the manufacture of window-blinds, curtains, and hangings,—being a communication.

1062. Susan Walker, of Horsham, for improvements in clogs and pattens.

1063. George Elliot and William Russell, both of Saint Helen's, Lancashire, manufacturing chemists, for certain improvements in boiling down saline solutions.

1064. Jean François Isidore Caplin, of Strawberry-hill, near Manchester, orthorachidist, for improvements in apparatus for preventing or curing a stooping of the head or of the body.

1065. John Mason, of Rochdale, machine-maker, for improvements in the processes of bleaching and dyeing textile materials and fabrics.

1066. Alexander Rotscheff, of Queen-street, Gent., for improvements in machinery or apparatus for separating gold or other valuable substances from earth or other extraneous matters,—being partly a communication.

1067. Charles James Wallis, of Hand-court, Holborn, mechanical draughtsman, for improvements in machinery for amalgamating, mixing, and grinding substances together.

1068. Anthony Norris Groves, of Bristol, Gent., for improvements in apparatus for heating, drying, and evaporating.

1069. Richard Taylor, junior, of Queen-street, Cheapside, and John Arthur Phillips, of Upper Stamford-street, Blackfriars, for improvements in treating zinc ores.

1070. Clement Dresser, of Basinghall-street, for improvements in combining materials to be used in substitution of whalebone and other flexible and elastic substances,—being a communication.

1071. Thomas Dunn, of Pendleton, near Manchester, engineer; Hugh Greaves, of Manchester, engineer; and William Watts, junior, of Miles Platting, near Manchester, engineer, for improvements in machinery and apparatus for altering the position of engines and carriages on railways.

The above bear date December 15*th.*

1072. Peter Armand le Comte de Fontainemoreau, of South-street, Finsbury, for an improved lamp, which he calls "lamp omnibus,"—being a communication.

1073. André Cointry, of Nantes, France, manufacturer, for improvements in the manufacture of bread and biscuits.

1074. John Jeremiah Payne, of Saint Stephen's-terrace, Wharf-road, King's-cross, for an improved axle in two parts, applicable to railway and every other description of carriages and vehicles, both public and private.

1075. Charles Barlow, of Chancery-lane, for improvements in bleaching, purifying, and concentrating sulphuric acid; parts of which invention are applicable to evaporating other liquids.

1076. John Healey, of Bolton-le-Moors, spindle-maker, for the application of glass and enamel to the flyers and other parts of machinery used in the preparing, spinning, doubling, winding, warping, dressing, and weaving of cotton, wool, flax, silk, and other fibrous materials.

1077. Richard Blades, of Liverpool, surveyor, for certain improvements in the method of cleansing sewers and drains, and in the machinery or apparatus connected therewith.

1078. James Stevens, of Birmingham, glass manufacturer, for the invention of improvements in grinding and polishing lenses.

1079. Sir Francis Charles Knowles, of Lovell Hill, in the county of Berks, Baronet, for improvements in the manufacture of iron.

1080. Thomas Motley, of Bristol, civil engineer, for improvements in constructing the tablets, letters, and figures for indicating the names, designations, or numbers of streets, houses, buildings, and other places.

1081. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for a new system of stoppering bottles and other vessels,—being a communication.

1082. Archibald Slate, of Woodside Iron Works, near Dudley, civil engineer, for an improvement in propulsion.

1083. Archibald Slate, of Woodside Iron Works, near Dudley, civil engineer, for improvements in the production of motive power from elastic fluids.

1084. Archibald Slate, of Woodside Iron Works, near Dudley, civil engineer, for improvements in propelling vessels.

1085. James Dunlop, of Haddington, Scotland, saddler, for improvements in saddles.

1086. George Michiels, of Holywell-street, for improvements in the manufacture and purification of gas.

1087. George Sands Sidney, of Brixton-road, Gent., for improvements in jugs or vessels for containing liquids.

The above bear date December 16th.

1088. Henry Kenyon, of Liverpool, Lancaster, bone-grinder, for improvements in machinery for grinding bones and other substances.

1089. Frederick Joseph Bramwell, of Millwall, engineer, for improvements in steam-engines.

1090. Archibald Slate, of Woodside Iron Works, near Dudley, civil engineer, for certain improvements in the arrangements for working the slide-valve for the induction and eduction of fluids.

1091. Archibald Slate, of Woodside Iron Works, near Dudley, civil engineer, for an invention in steam-boilers.

1092. Robert William Billings, of Saint Mary's-road, Canonbury, architect, for improved apparatus for ventilating chimneys and apartments.

1093. William Wilkinson, of Nottingham, framework knitter, for improvements in the manufacture of looped-pile and cut-pile fabrics, and the machinery employed therein.

1094. Alfred Krupp, of Essen, Prussia, cast-steel manufacturer, for improvements in cannons.

1095. John Filmore Kingston, of Carrol County, Maryland, United States of America, engineer, for improvements in obtaining reciprocating motion and in propelling and steering vessels.

1096. James Langridge, of Bristol, stay manufacturer, for improvements in the manufacture of stays.

The above bear date December 17th.

1097. Joseph Matthews, of Strickland-gate, Kendal, gun-maker, for a burglary alarm.

1098. George Thomson, of Dalston, cabinet-maker, for a machine for cutting wood.

1099. Thomas Young Hall, of Newcastle-upon-Tyne, coal owner, for improvements in safety-lamps.

1100. William Robertson, of Barrhead, in the county of Renfrew, machine-maker, for improvements in certain machines for spinning and doubling cotton and other fibrous substances.

1101. Thomas Elliott, of Stockton-on-Tees, engineer, for improvements in steam-engines, which are also applicable to pumps.

1102. Joseph Alexander Westerman, of Sestri Ponente, near Genoa, civil engineer, for improvements in the carbonization of turf, and the manufacture of paper and fuel therefrom.

1103. Edward Schischkar, of Halifax, manufacturer, for improvements in dyeing and coloring yarns and textile fabrics.

1104. Edward Schischkar, of Halifax, manufacturer, for improvements in coloring or staining yarns and textile fabrics.

1105. Charles Constant Boutigny, of Evreux, France, chemist, for improvements in distillation, and in the apparatus employed therein.

1106. John Clay, of Cottingham, Yorkshire, Esq., for improvements in the manufacture of coal-gas.

1107. William East, of Spalding, builder, for improvements in machinery for crushing clods, for dibbling and drilling land, and sowing seeds.

The above bear date December 18*th.*

1109. Jean Durandeau, of Paris, for certain means of obtaining marks and designs in paper.

1110. George Lingard, of Birmingham, manufacturer, for improvements in taps, and apparatus connected therewith, for admitting air to beer and other liquors under draught.

1111. William Wilkinson, of Nottingham, framework knitter, for improvements in the manufacture of paper and pasteboard, and in the production of a substance applicable for veneers, panels, and to many purposes to which gutta-percha and papier-maché are applicable.

1112. Peter Armand le Comte de Fontainemoreau, of South-street, Finsbury, for an improved mode of constructing night-stools and utensils, water-closets, urinaries, and other recipients of fecal matters; also applicable to apparatus for containing fluids liable to or in a state of decomposition,—being a communication.

1114. Charles Watson, of the Bazaar, King-street, Portman-square, saddler, for improvements in carriage and stable-brushes.

1115. William John Silver, of Clark-street, Stepney, for improvements in giving motion to capstan and other barrels.

1116. George Gwynne, of Hyde-park-square, Esq., and George Fergusson Wilson, of Belmont, Vauxhall, for improvements in the manufacture of candles, night lights, and soap.

1117. Robert Powell, of Berwick-street, tailor, for improvements in coats and outer garments.

The above bear date December 20*th.*

1118. Ferdinand D'Albert, of South-street, Finsbury, Gent., for a certain chemical combination for replacing indigo, which he calls "D'Albert Blue."

1119. Jean Baptiste Moinier, of Rue de Marseille, and Charles Constant Boutigny, of Rue de Flandre, of La Villette, France, for improvements in concentrating syrups and other solutions, and in distillation.

1120. Jean Baptiste Moinier, of Rue de Marseille, and Charles Constant Boutigny, of Rue de Flandre, of La Villette, France, for improvements in distilling fatty matters.

1121. George Beadon, of Creechbarrow, near Taunton, Commander R.N., for improvements in constructing and propelling ships and vessels.

1122. John Akrill, of Artichoke-hill, near the London Docks, for improvements in the manufacture of bricks, tiles, and other earthenware articles.

1123. Warren De la Rue, of Bunhill-row, for improvements in preparing the surfaces of paper and card-board.

1124. John Akrill, of Artichoke-hill, near the London Docks, for improvements in the manufacture of crucibles.

1125. Edward Duke Moore, of Ranton Abbey, near Eccleshall, merchant, for an improved preparation of malt and hops.

1126. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in lamps, and in apparatus to be used therewith,—being a communication.

1127. John Roydes, of Greengate, near Rochdale, cotton carder, for improvements in machinery or apparatus for drawing cotton and other fibrous substances.

1128. Ephraim Mosely, of Grosvenor-street, dentist, for improvements in the manufacture of artificial masticating apparatus.

The above bear date December 21st.

1129. Celestine Denis veuve Quinchez, of Paris, for a new or improved fabric or texture, which may be used for making mantles, bonnets, and other articles of female attire.

1130. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for improvements in the means of urging the fires and increasing the draft of furnaces, and in arresting the sparks given off from the chimneys of locomotive engines,—being a communication.

1131. John Roberts, of Upnor, in the county of Kent, potter, for improvements in apparatus for preserving animal and vegetable matters, and for cooling wines and other liquids.

1132. Frank Clarke Hills, of Deptford, manufacturing chemist, for improvements in purifying gas.

1133. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in machinery or apparatus for forging iron and other metals,—being a communication.

1134. John Filmore Kingston, of Carrol County, Maryland, in the United States of America, engineer, for improvements in obtaining motive power by electro-magnets.

1135. William Aspdin, of Blackwall, Gateshead-upon-Tyne, cement manufacturer, for improvements in the manufacture of Portland and other cements.

1136. Thomas Greenshields, of Stoke Works, in the county of Worcester, for improvements in the manufacture of alkali.

1137. Frederick Ayckbourn, of Guildford-street, Russell-square, patent folding boat manufacturer, for improvements in rendering certain materials impervious by air or water.

1138. Thomas Vicars, the elder, and Thomas Vicars, the younger, both of Liverpool, Lancaster, engineers, for improvements in baking-ovens, and apparatus for placing the bread, biscuits, or other articles to be baked therein.

1139. John Livesey, of New Lenton, draughtsman, for improvements in lace machinery, and in piled fabrics made from such machinery.

1140. John Moore Hyde, of Bristol, philosophical instrument-maker, for improvements in steam-engines and the production of steam for the same.

The above bear date December 22nd.

1141. Alfred John Hobson, of Wallsall, writing clerk, for a new or improved metallic bedstead.

1142. John William Couchman, of Princes-terrace, Pultney-street, Barnsbury-road, for safety fastening window sashes.

1143. Alexandre Deutsch, of Paris, manufacturer, for improvements in treating oil of colza, and similar oils.

1144. Christopher Binks, of Stratford, for improvements in the composition of paints.

1145. William Westley, of Derby, engineer, and Richard Bayliss, of Derby, surveyor, for an improved fastener, applicable to the fastening of window-sashes, tables, and other similar purposes.

1146. Nicolas Malinau, of Bordeaux, manufacturer, for improvements in stopping or covering bottles, decanters, pots, and other receptacles of glass, porcelain, and earthenware, and in the machinery connected therewith.

1147. George Gwynne, of Hyde-park-square, Esq., and George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating fatty and oily matters.

1148. William Roper, of Hall-street, City-road, die sinker, for improvements in shaping and ornamenting sheet metal.

1149. Jean Louis David, of Paris, manufacturer, for certain improvements in the manufacture of woollen fabrics.

1150. Peter Fairbairn, of Leeds, machinist, and Samuel Renny Mathers, of the same place, flax spinner, for certain improvements in machinery for carding flax, hemp, china-grass, and jute, and the tow of the several materials before mentioned.

1151. James Davis, of Hemel Hempstead, agricultural implement maker, for improvements in machinery for manufacturing bricks and tiles.

The above bear date December 23rd.

1152. Fulcran Peyre and Michel Dolques, of Lodéve, France, for improvements in machinery for dressing woollen cloth.

1153. John Hinks, of Birmingham, and George Wells, of Birmingham, manufacturers, for a new or improved pen-holder.

1154. John Lowther Murphy, of Birmingham, dentist, for an improvement in drawing off liquids from barrels and other vessels.

1155. Joseph Burch, of Crag Hall, near Macclesfield, carpet manufacturer, for certain improvements in machinery for reaping, loading, stacking, and storing grain, and other agricultural produce.

1156. Joseph Burch, of Crag Hall, near Macclesfield, carpet manufacturer, for certain improvements in machinery, applicable to thrashing, winnowing, cleaning, and sorting grain, and to other agricultural purposes.

1157. Joseph Burch, of Crag Hall, near Macclesfield, carpet manufacturer, for certain improvements in passenger and other carriages.

1158. William Ramsell, of Deptford, boiler maker, for improvements in boilers, for generating steam and hot air, together or separately.

1159. Robert Griffiths, of Great Ormond-street, for improvements in giving motion to drills.

1160. George Michiels, of Holywell-street, for improvements in the manufacture of gas.

1161. George Bower, of St. Neot's, ironmonger, for improvements in the manufacture of gas for illumination.

1162. James Godfrey Wilson, of Lindsey House, Chelsea, civil engineer, for improvements in the construction of carriages and vehicles for railroads and common roads; parts of the said improvements being also applicable to parts of locomotive engines used on railroads.

1163. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for improvements in obtaining and applying motive power,—being a communication.

1164. Robert Lublinski, of Devonshire-street, Bishopsgate, sculptor in ivory, for an improved joint for umbrella and parasol sticks.

1165. William Tuer, William Hodgson, and Robert Hall, of Bury, machine makers, for improvements in the manufacture of textile fabrics, and in machinery or apparatus for weaving; part of which is also applicable to machinery for preparing textile materials.

1166. Pierre Charles Nesmond, of Bellac, France, for improvements in machinery applicable to the manufacture of ice, and to refrigerative purposes generally.

The above bear date December 24th.

1167. John Anderson, of Rugby, iron-founder, for heating and ventilating apartments, and for remedying smoky chimneys by a radiant ventilating grate.

1168. George Ingham, of Rochdale, for certain improvements in machinery for drawing cotton and other fibrous materials.

1169. John Frederick Gordon, clerk, of Strangford, in the county of Down, for an invention for facilitating the turning of four-wheeled carriages, and bringing the front and hind wheels nearer to each other, entitled "the castor axle."

1170. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating certain fatty bodies.

1171. George Gwynne, of Hyde-park-square, Esq., and George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating fatty and oily matters.

The above bear date December 27th.

1172. John Mason, of Rochdale, machine maker, for improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.

1173. James Darling, of Manchester, book-keeper, and Henry Spencer, of Rochdale, manager, for improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

1174. William Beckett Johnson, of Manchester, for improvements in steam-boilers and in apparatus connected therewith.

1175. Pierre François Giraud, of Paris, for an apparatus for the interior of bonnets, to fix them on the head.

1176. Joseph Gidman, of Prescot, house agent, for a skate.

1177. Edward Mucklow, of Bury, manufacturing chemist, for certain improvements in the construction of retorts for the manufacture of pyroligneous acid, or for other purposes of destructive distillation.

1178. Edward Mucklow, of Bury, manufacturing chemist, for certain improvements in machinery or apparatus for cutting or rasping dye woods.

1179. Edward Mucklow, of Bury, manufacturing chemist, for certain improvements in preventing the escape or radiation of heat from steam-boilers or generators, and also in preserving marine and other boilers from the effects of incrustation.

1180. William Busfield, of Bradford, for improvements in apparatus for combing wool and other fibrous substances requiring like process.

1181. Ami Bernard, of Belfast, manufacturer, and Aimé Koch, of Belfast, manufacturer, for improvements in machinery and apparatus for preparing flax-straw, flax, and certain other fibrous substances; part of which improvements are applicable to machinery for scutching and heckling.

1182. James Webster, of Leicester, engineer, for improvements in the manufacture of springs,

1183. Claude Joseph Edmée Junot, of Rue Basse Passy, France, for improvements in the mode of reducing several metallic substances, hitherto unused, and applying them, so prepared, to the plating of other metals and substances, by means of electricity, —being a communication.

1184. Samuel Clegg, of Regent's-square, for improvements in apparatus for measuring gas.

The above bear date December 28th.

1186. John Copling, jun., of The Grove, Hackney, Esq., for a safeguard railway signal.

1187. Henry Kibble, of Guildford, Gent., for a traveller's monitor, or ticket and parcel protector.

1188. John Whichcord the younger, and Samuel Egan Rosser, of Great Russell-street, Bloomsbury, civil engineers, for certain improvements in the mode of burning and applying gas for light and heat.

1189. Benjamin Glorney, of Mardyke Mills, near Dublin, miller, for improvements in obtaining and applying motive power.

1190. Samuel John Pittar, of Paris-street, Lambeth, civil engineer, for improvements in goloshes or coverings for boots and shoes.

1191. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in the manufacture of carpets,—being a communication.

1192. Archibald Douglas Brown, of Glasgow, cabinet maker, for improvements in the construction of portable articles of furniture.

1193. William Brown, of Chapel Hall, in the county of Lanark, engineer, for improvements in forging, shaping, and crushing iron and other materials; which improvements, or modifications thereof, are also applicable for obtaining and applying motive power for general purposes.

1194. James Edgar Cook, of Greenock, for an improved composition for the prevention of the decay and fouling of ships' bottoms and other exposed surfaces.

1195. John Walter Friend, of Canute-road, Southampton, watch-maker, for an improved method of measuring and registering the distance run by ships and boats proceeding through the water.

1196. James Power, of Paris, merchant, for silvering all sorts of metals, and of glass.

1197. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for certain improvements in machinery for grinding and reducing gold quartz to an impalpable powder, and amalgamating the said ground quartz with quicksilver; the same being applicable also to the pulverizing and washing of ores,—being a communication.

1198. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for a new mode of advertising,—being a communication.

The above bear date December 29th.

1199. Thomas Walker, of Birmingham, for improvements in apparatus for regulating the speed of steam-engines.

1200. Thomas Walker, of Birmingham, for improvements in apparatus for regulating the dampers of steam-boiler and other

evaporating furnaces; which apparatus is also applicable for indicating the pressure of steam or other fluids.

1201. Henry Hutchinson, of Sheffield, book-keeper, for improvements in machines for washing bottles.

1202. James Ward, truss maker, and William Burman, brick-maker, both of Stratford-on-Avon, for certain improvements in machinery for making bricks and tiles.

1203. Robert Stephen Oliver, of Edinburgh, clothier, for certain improvements in waterproof and other garments.

1204. Julius Singer, of Mabledon-place, Burton-crescent, tailor, for improvements in wearing apparel.

1205. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for an improved method of attaching metals to other metals,—being a communication,

1206. Robert Taylerson, Newcastle-upon-Tyne, for improvements in ship-building.

The above bear date December 30th.

1207. Thomas Harrison, of Hough, in the county of Chester, joiner, for improvements in steam-engines.

1208. William Morton Pickslay, of Brooklyn, State of New York, and United States of America, for an improvement in the blast of furnaces, and which he designates the "calorific blast," and which increases the effective power of furnaces,—being a communication.

1209. Thomas Benjamin Smith, of Bristol, for improvements in calcining certain ores, and in the construction of furnaces for that purpose, and for converting certain products, arising in the process, into an article of commerce not heretofore produced therefrom.

1210. David Dixon, of Parson's Mead, Croydon, engine-driver, for an improved arrangement of apparatus for retarding and stopping locomotive engines, tenders, and carriages.

1211. James Lord, of the Inner Temple, Barrister-at-Law, for improvements in carriage-steps.

The above bear date December 31st.

1853.

1. William Wilkinson, of Nottingham, framework knitter, for improvements in taps and other apparatus for filtering and drawing off liquids.

3. John Addison, Captain H. E. I. C. S., of Baker-street, Portman-square, and Henry S. Eicke, Gent., of Lawn-place, South Lambeth, for making a tessellated pavement.

4. Junius St. John Eicke, of Lawn-place, South Lambeth, Gent., for deodorizing and preparing American and other resins for mixing with grease, tallows, and wax, so as to improve them by giving them a greater hardness and consistency, and rendering them less liable to be affected by change of temperature.

5. Joseph John William Watson, of Old Kent-road, Doctor of Philosophy, and William Prosser, of Adam-street, Adelphi, Gent., for an improved method of manufacturing steel and of carburizing iron.
6. Thomas Billyeald, of Ison-green, Lenton, lace-manufacturer, for an improvement in the apparatus and arrangement of apparatus for making looped fabrics.
7. Joseph Brough, of Longton, Staffordshire, for a new manufacture of a vitrified substance, and its application, alone or in combination with mineral, earthy, and plastic substances, to various useful purposes in the arts; and for certain other new applications of known plastic substances.
8. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in the manufacture of oils,—being a communication.
9. Matthew Tomlinson, of Hulme, Manchester, druggists' sundries merchant, for certain improvements in the manufacture of "species-jars," or show-jars.

The above bear date January 1st.

10. David Hulett, of High Holborn, for improvements in the manufacture of ornaments for lamps, chandeliers, and architectural purposes.
11. John Bleackley, jun., of Myrtle-grove, Prestwich, bleacher, for improvements in machinery to be used in washing, bleaching, dyeing, and sizing yarns and fabrics.
12. Edme Augustin Chameroy, of Paris, manufacturer, for improvements in motive power engines, and in the application of motive power to the same.
13. Lazare François Vaudelin, of Upper Charlotte-street, Fitzroy-square, for improvements in apparatus for retarding and stopping railway carriages.
14. Charles Edwards Amos, of the Grove, Southwark, engineer, for certain improvements in the construction of centrifugal pumps.

The above bear date January 3rd.

15. Peter Armand le Comte de Fontainemoreau, of South-street, Finsbury, for improvements in axle-boxes,—being a communication.
16. Edward Clarence Shepard, of Duke-street, Westminster, Gent., for improvements in the manufacture of gas.
17. Joseph James Welch, and John Stewart Margetson, of Cheapside, for certain improvements in the manufacture of travelling-cases, wrappers, and certain articles of dress hitherto manufactured of leather.
18. Charles John Burnett, of Edinburgh, Gent., for certain improvements in apparatus of mechanism for driving machinery through the agency of water.

19. George Gwynne, of Hyde-park-square, Esq., and George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating fatty and oily matters.

The above bear date January 4th.

20. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in atmospheric engines,—being a communication.
21. Jean Baptiste Pascal, of Lyons, for improvements in obtaining motive power.
22. Gustave Eugene Michel Gerard, of Paris, manufacturer, for improvements in manufacturing and treating caoutchouc.
23. Gustave Paul de L'Huynes, of Frith-street, Soho-square, Doctor, for improvements in medical portative electro galvanic apparatus.
24. Thomas Shilton, of Baddesley, Ensor, Warwickshire, for certain improvements in weighing-machines.
25. Charles Frederick Whitworth, of Brighton, for improvements in apparatus to be used in connection with railway signals for the purpose of indicating the approach of trains and of preventing collisions.
26. Francis Edwards, of Park-place, Toxteth-park, near Liverpool, enameller, for improvements in the method of lettering, figuring, and ornamenting the surface of enamel used for dials and other purposes.
27. Frederick Arnold, of Devonport, ironmonger, for improvements in heating the water in a bath or other vessel.
28. Herbert Newton Penrice, of Sheffield, Lieutenant R. E., for improvements in propelling vessels.
29. William Bendwell, of Great Queen-street, Westminster, for improvements in treating sewage waters and matters.

The above bear date January 5th.

30. Emile Grillet, of Soho-square, Gent., for improvements in renewing the teeth of files.
31. William Louis Sheringham, of Southsea, Capt., R.N., for illuminating buoys and beacons in harbours, roadsteads, and rivers.
32. Edward Hutchinson, of Tyldesley, in the county of Lancaster, corn-miller, for certain improvements in the mode or method of preparing, cleaning, drying, and otherwise treating wheat, pulse seeds, and other grain.
33. John Browne, of Charles-street, Regent-street, Gent., for improvements in the construction of ships, or other navigable vessels, and in machinery or apparatus connected therewith.
34. Robert Watson Savage, of Saint James's-square, Gent., for an alarum bedstead.
36. Robert Whinerey, of Liverpool, leather merchant, for certain improvements in or upon the manufacture and treatment of leather, either alone or in combination with other materials.

37. Michael Smith, of Liverpool, Gent., for improvements in machinery for separating gold or other valuable substances from other materials.
38. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in roving, spinning, or twisting cotton or other fibrous substances; which invention he denominates "Larwill's improvements,"—being a communication.
39. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in the construction of bearings or steps for shafts, turntables, or moveable platforms, which invention he denominates "Parry's improvements,"—being a communication.
40. William Beales, of Louth, engineer, for an improved cement for the resistance of fire.
41. Peter Graham, of Oxford-street, for improvements in the manufacture of carpets and other piled fabrics,—being a communication.
42. William Sykes Ward, of Leeds, Esq., for a thermostat, or apparatus for the regulation of temperature and of ventilation.
43. William Watson, the younger, of Leeds, manufacturing chemist, for improvements in apparatus for the manufacturing of prussiate of potash.

The above bear date January 6th.

44. Charles De Bergue, of Dowgate-hill, London, merchant, for improvements in the permanent way of railways.
45. Thomas Pape, of Loughborough, glove manufacturer, for improvements in circular frames and in the fabrics and articles produced thereon.
46. William Charles Scott, of Camberwell, Gent., for improvements in wheels.
47. Charles William Lancaster, of New Bond-street, gun manufacturer, for an appendage to bullet moulds.
48. George Stewart, of Enniskillen, Gent., for improvements in railways, and in the propulsion of engines, carriages, and other vehicles thereon.
49. Herbert George James, of Leadenhall-street, weighing machine manufacturer, for improvements in the mode of securing and retaining corks and stoppers in bottles,—being a communication.
50. Richard Gittings, of Thayer-street, Manchester-square, for improvements in tills.
51. Hezekiah Marshall, of Canterbury, architect, for certain improvements in the transmission and emission of air and sound.
52. James Egleson Anderson Gwynne, of Essex Wharf, Strand, engineer, for the propulsion and supporting of vessels, vehicles, and other bodies, on, through, and over the water,—being a communication.

The above bear date January 7th.

53. Robert Lovely, of Adam-street, Adelphi, civil engineer, for certain improvements in the application of steam to the propulsion of carriages on common roads; parts of which improvements are applicable to the construction of carriages for common roads.
54. Thomas Smith, of Lambeth, potter, for certain improvements in soil pans.
55. John Abraham, of Birmingham, machinist, for a new or improved method of manufacturing percussion caps.
56. Henry Kibble, of Guildford, Gent., for improvements in obtaining a communication between guards, passengers, and drivers on railways.
58. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in stoves for cooking, and in apparatus connected therewith,—being a communication.
59. Francis Parker, of Northampton, boot and shoe manufacturer, and William Dicks, of Leicester, boot-maker, for improvements in boots, shoes, and that kind of spatterdashes termed Antigropelos.
60. Richard Walker, of Birmingham, percussion cap manufacturer, for an improvement in the manufacture of buttons.

The above bear date January 8th.

61. Antoine Hiron, of Broad-street, Golden-square, sculptor, for improvements in the means of copying or reproducing models or figures in marble, stone, ivory, or other substances.
62. Charles Stewart Duncan, of Charing-cross, Gent., for certain improvements in rendering bottles, jars, and other like receptacles, air and water tight, and for raising and measuring the liquid contents thereof.
63. John Deane, of Whitstable, submarine surveyor, for an improved construction of diving helmet.
64. Michael Fitch, of Chelmsford, salt manufacturer, for improvements in ovens.
65. William Webb, of Princes-street, Spitalfields, for improvements in the manufacture of carpets.
66. John Davies Morries Stirling, of the Larches, Camphill, near Birmingham, for improvements in the manufacture of percussion caps.
67. Frederick Schneider, of Berne, Switzerland, for a chair to be employed for preventing sea sickness.
68. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for an improved mode of separating substances of different specific gravities,—being a communication.

List of Patents

Granted for SCOTLAND, from the 22nd November, 1852, *to the 22nd January,* 1853.

To John Knowles, of Bolton-le-Moors, in the county of Lancaster, cotton-spinner, for improvements in certain machinery for preparing cotton and other fibrous substances, for reversing the direction of motion in, and for regulating the speed of, machines.—Sealed 23rd November.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in machinery or apparatus for sewing,—being a communication.—Sealed 24th November.

Richard Christopher Mansell, of Ashford, in the county of Kent, civil engineer, for improvements in the construction of railways, in railway rolling stock, and in the machinery for manufacturing the same.—Sealed 17th December.

Henry Bordson, of Bolton, in the county of Lancaster, bleacher, for improvements in machinery for stretching, drying, and finishing woven fabrics.—Sealed 22nd December.

James Norton, of Ludgate-hill, London, merchant, for improvements in apparatus for ascertaining and registering the mileage run by public vehicles during a given period; also the number of persons who have entered in, or upon, or are travelling in, public vehicles,—part of which improvements is applicable to public buildings, and other places where tolls are taken.—Sealed 22nd December.

Patrick Mc Anaspie, of Liverpool, for a new manufacture of Portland stone, cement, and other compositions for general building purposes and hydraulic works.—Sealed 22nd December.

Charles James Wallis, of Clarendon Chambers, Hand-court, Holborn, London, civil engineer, for improvements in machinery for crushing, pulverizing, and grinding stone, quartz, and other substances,—being a communication.—Sealed 22nd December.

Edwin Petitt, of Kingsland, in the county of Middlesex, civil engineer, and James Forsyth, of Caldbeck, Cumberland, spinner, for improvements in machinery for twisting, drawing, doubling, and spinning of cotton, wool, silk, flax, and other fibrous substances.—Sealed 22nd December.

James Higgins, of Salford, machine-maker, and Thomas Schofield Whitworth, of the same place, mechanic, for certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances.—Sealed 23rd December.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, London, mechanical draughtsman, for improvements in the mode of priming fire-arms,—being a communication.—Sealed 23rd December.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in machinery or apparatus for cutting paper, pasteboard, or other similar substances,—being a communication.—Sealed 23rd December.

John Charles Wilson, of Redford Flax Factory, Thornton, Kirkcaldy, for improvements in the machinery and processes employed in and for the manufacture of flax and other fibrous vegetable substances.—Sealed 23rd December.

Samuel Morris, of Stockport, boiler-maker, for certain improvements in steam-boilers.—Sealed 24th December.

Peter Armand Le Comte de Fontainemoreau, of South-street, London, for improvements in producing gas, and in its application to heat and light.—Sealed 24th December.

James Fletcher, of Leyland, near Bristow, county of Lancaster, bleacher, for improvements in machinery or apparatus for stretching and dyeing woven fabrics.—Sealed 24th December.

Claude Arnoux, of Paris, for certain improvements in the construction of railway carriages.—Sealed 24th December.

Andrew Crosse, of Broomfield, county of Somerset, for improvements in the extraction of metals from their ores.—Sealed 27th December.

Robert Reyburn, of Greenock, chemist, for improvements in printing on silk and other fabrics and yarns.—Sealed 27th December.

Moses Poole, of Serle-street, London, for improvements in combining caoutchouc with other materials,—being a communication.—Sealed 28th December.

Moses Poole, of Serle-street, London, for improvements in the manufacture of combs,—being a communication.—Sealed 28th December.

James Johnson, of Waterloo-place, Haggerstone-bridge, Kingsland, London, hat manufacturer, for certain improvements in the manufacture of hats.—Sealed 28th December.

Samuel Fox, of Stockbridge Works, Deepcar, near Sheffield, for improvements in umbrellas and parasols.—Sealed 28th December.

Henry Medhurst, of Clerkenwell, London, engineer, for improvents in water-meters, and in regulating, indicating, and ascertaining the supply of water and liquids.—Sealed 29th December.

William Burgess, of Newgate-street, London, gutta-percha merchant, for improvements in the manufacture of gutta-percha tubing.—Sealed 29th December.

Robert Griffiths, of Clifton, engineer, for an apparatus for improving and restoring human hair.—Sealed 29th December.

George Robert Booth, of Wandsworth-road, Surrey, for improvements in the manufacture of gas.—Sealed 29th December.

Sarah Lester, of St. Peter's-square, Hammersmith, for improvements in treating the seeds of flax and hemp, and also in the

treatment and preparation of flax and hemp for dressing.—Sealed 29th December.

William Smith, of Little Noolstone, in the county of Bucks, for improvements in machinery for reaping.—Sealed 30th December.

Frederick Dam, of Brussels, chemist, for improvements in preventing incrustation in boilers.—Sealed 30th December.

William Septimus Losh, of Wreay Sykes, near Carlisle, for improvements in the purification of coal gas.—Sealed 30th December.

George Frederick Paratt, of Piccadilly, London, for improvements in life-boats.—Sealed 30th December.

Alexander Parkes, of Pembrey, in the county of Carmarthen, for improvements in obtaining and separating certain metals.—Sealed 31st December.

John Moore, of Arthur's Town, in the county of Wexford, for improvements in nautical instruments, applicable for ascertaining and indicating the true spherical course and distance between port and port.—Sealed 31st December.

Joseph Leese, jun., of Manchester, calico printer, for an improved system of preparing, cutting, and engraving rollers, to be used for printing woven and other fabrics; and improved machinery for printing and washing the same fabrics.—Sealed 31st December.

John Jeffrey Dixon, of the Royal Slate Quarries, Bangor, and Arthur Dodson, of Bangor, for improvements in machinery and apparatus used in quarrying slate and stone, and in cutting, dressing, planeing, framing, and otherwise working and treating slate and stone; and in apparatus and waggons used for moving and carrying slate and stone; and improvements in joining, framing, and connecting slate and stone.—Sealed 31st December.

Henry Stothert, of Bath, engineer, for improvements in the manufacture of manure,—being a communication.—Sealed 31st December.

Charles Thomas, of Bristol, soap manufacturer, for improvements in the manufacture of soap.—Sealed 3d January, 1853.

Hugh Lee Pattinson, of Scotshouse, near Newcastle-upon-Tyne, manufacturing chemist, for improvements in smelting certain substances containing lead.—Sealed 3rd January.

George Hutcheson, of Glasgow, for a method of preparing oils for lubricating and burning.—Sealed 3rd January.

Solomon Andrews, of Perth Amboy, United States, engineer, for improvements in machinery for cutting, punching, stamping, forging, and heating metal and other substances; which are also applicable to the driving of piles and other similar purposes, and to crushing and pulverizing ores and other hard substances.—Sealed 4th January.

John Trotman, of Deersley, Gloucestershire, for improvements in anchors.—Sealed 4th January.

Samuel Cunliffe Lister, of Manningham, near Bradford, for improvements in treating and preparing, before being spun, wool, cotton, and other fibrous materials.—Sealed 5th January.

Thomas Allan, of Edinburgh, engineer, for improvements in producing and applying electricity, and in apparatus employed therein.—Sealed 5th January.

William Hetherington, of Handsworth, near Birmingham, for improved machinery for stamping or shaping metals,—being a communication.—Sealed 6th January.

John Ramsden, of Manchester, screw-bolt manufacturer, for certain improvements in machinery or apparatus for cutting screws. —Sealed 7th January.

Thomas Willis, of Manchester, machine maker, for certain improvements in machinery or apparatus for winding yarns or threads; and also improvements in looms for weaving.—Sealed 7th January.

Julian Bernard, of Guildford-street, Russell-square, London, for improvements in the manufacture or production of boots and shoes, and in materials, machinery, and apparatus connected therewith.—Sealed 10th January.

Martyn John Roberts, of Woodbank, in the county of Bucks, for improvements in the production of electric currents, in obtaining light, motion, and chemical products and effects, by the agency of electricity; part or parts of which improvements are also applicable to the manufacture of acids, and to the reduction of ores.—Sealed 11th January.

John Kirkham, of New Road, London, civil engineer, and Thomas Nesham Kirkham, of Fulham, civil engineer, for improvements in the manufacture of gas for lighting and heating.—Sealed 11th January.

William Hunt, of Stoke Prior, county of Worcester, manufacturing chemist, for certain improved modes or means of producing or obtaining ammoniacal salts.—Sealed 12th January.

The Earl of Dundonald, for improvements in the construction and manufacture of sewers, drains, water-ways, pipes, reservoirs, and receptacles for liquids or solids, and for making columns, pillars, capitals, pedestals, vases, and other useful and ornamental objects, from a substance never heretofore employed for such manufactures.—Sealed 12th January.

Charles Butler Clough, of Tyddyn-wold, Flintshire, for certain improvements in machinery or apparatus applicable to the purposes of brushing and cleaning.—Sealed 14th January.

Roger Hind, of Warrington, engineer, for certain improvements in the construction of machinery or apparatus applicable to weighing-machines, weigh-bridges, railway turntables, cranes, and other similar substances.—Sealed 14th January.

John Ridgway, of Cauldon-place, Staffordshire, china manufacturer, for certain improvements in the method or process of ornamenting or decorating articles of glass, china, earthenware, and other ceramic manufactures.—Sealed 14th January.

Charles Green, of Birmingham, for improvements in the manufacture of brass tubes.—Sealed 14th January.

John Lawson and Edward Lawson, of Leeds, machine makers, for improvements in machinery for scutching and cleaning flax straw.—Sealed 14th January.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for improvements in steam and other gauges,—being a communication.—Sealed 17th January.

George Payne, of Wandsworth-road, Surrey, for improvements in drying animal charcoal and vegetable substances.—Sealed 17th January.

David Napier, of Millwall, for improvements in steam engines.—Sealed 17th January.

William Wood, of Monkhill-house, near Pontefract, for improvements in the manufacture of carpets and other fabrics.—Sealed 17th January.

William Hodgson, of Skircoat, Yorkshire, engineer, for improvements in the manufacture of woven, textile, and looped fabrics, and in the machinery employed therein.—Sealed 18th January.

Robert Adams, of King William-street, London, for improvements in rifles and other fire-arms.—Sealed 18th January.

Thomas Marsden, of Salford, machine maker, for improvements in machinery for heckling and combing flax and other fibrous materials.—Sealed 18th January.

Christopher Rand, of Shad Thames, Surrey, for improvements in grinding wheat and other grain.—Sealed 19th January.

William Wood, of Pontefract, for improvements in the manufacture of carpets and other fabrics, and in apparatus or machinery connected therewith.—Sealed 19th January.

Richard Edward Hodges, of Bycroft, Herefordshire, for improvements in mechanical purchases; which are also applicable in whole or in part to projectiles.—Sealed 19th January.

Frederick Benjamin Geithner, of Camden-street, Birmingham, for improvements in the manufacture of castors and legs of furniture.—Sealed 19th January.

William Armand Gilbee, of 4, South-street, Finsbury, London, for certain improvements in machinery for cutting corks,—being a communication.—Sealed 20th January.

Alfred Richard Corpe, of 15, King-street, St. James's, London, for improvements in trouser-strap fasteners.—Sealed 20th January.

Stephen Reed, of Newcastle-upon-Tyne, for certain improvements in railway rails and chairs.—Sealed 20th January.

Charles Harratt, of Royal Exchange Buildings, London, for improvements in rolling iron.—Sealed 20th January.

Richard Dover, of New-street, Spring-gardens, London, for improvements in treating sewerage, in obtaining products therefrom, and combining such products with other matters.—Sealed 20th January.

Robert Beart, of Godmanchester, for improvements in the manufacture of bricks and tiles.—Sealed 21st January.

Hector Ledru, of Paris, civil engineer, for improvements in heating.—Sealed 21st January.

Henry Adcock, of Northumberland-street, Strand, London, for improvements in the manufacture of pipes, chimney-pots, and hollow vessels, also bricks, tiles, copings, columns, and other articles used in building houses and other structures.—Sealed 21st January.

New Patents.

Sealed under old Law.

Thomas Fildes Cocker, of Sheffield, for certain improvements in annealing or softening metallic wires and sheets of metal; also in reducing compressing, or drawing metallic wires; also in the manufacture of metal rolls.—Sealed 11th January, 1853.

Patents sealed under Patent Law Amendment Act, 1852.

1. Robert Adams, of King William-street, for improvements in ball-cartridges.—October 1.
2. George Henry Brockbank, of Crawley-street, Oakley-square, for improvements in upright piano-fortes.—October 1.
3. Peter Spence, of Pendleton Alum Works, Manchester, for improvements in obtaining power by steam.—October 1.
4. James Hodgson, of Liverpool, engineer, for improvements in constructing iron ships and vessels.—October 1.
5. Joshua Smith, of Sheffield, for improvements in table-knives. —October 1.
6. Moses Poole, of Serle-street, Gent., for improvements in the manufacture of guns and pistols.—October 1.
9. George Green, of the Mile-end-road, for improvements in the manufacture of casks.—October 1.
11. Thomas Wood Gray, of Warkworth-terrace, Commercial-road, for improvements in cocks and valves.—October 1.
13. Edward Lambert Hayward, of the Blackfriars-road, for improvements in lock-spindles.—October 1.
14. Thomas Christy, jun., of Gracechurch-street, for improvements in weaving hat-plush and other piled fabrics.—October 1.
15. Joseph Barker, of Kennington-lane, for improvements in fastenings.—October 1.
16. Moses Poole, of Serle-street, for improvements in the manufacture of telescope and other tubes.—October 1.
17. Charles Henry Newton, of Camden-road Villas, and George Leedham Fuller, of Peckham, for improvements in protecting electric telegraph wires.—October 1.

19. Moses Poole, of Serle-street, for improvements in moulding articles, when India-rubber combined with other materials are employed.—October 1.
20. Charles Frederick Bielefeld, of the Strand, for improvements in constructing portable houses and buildings.—October 1.
21. George Duncan and Arthur Hutton, of Chelsea, for improvements in the manufacture of casks.—October 1.
22. Henry Walker Wood, of Briton Ferry, near Neath, for improvements in the construction of ships and other vessels.—October 1.
24. Moses Poole, of Serle-street, for improvements in the making covers for, and in binding, books and portfolios, and in making frames for pictures and glasses.—October 1.
28. Moses Poole, of Serle-street, for improvements in coating metal and other substances with a material not hitherto used for such purposes.—October 1.
29. John Daniel Ebingre, of Brussels, for improvements in the manufacture of animal charcoal.—October 1.
30. Moses Poole, of Serle-street, for improvements in the manufacture of trunks, cartouch and other boxes, knapsacks, pistol-holsters, dressing, writing, and other cases, and sword and other sheaths.—October 1.
31. John Dunkin Lee, of Leadenhall-street, for improvements in covering railway trucks and other vehicles.—October 1.
32. William Pym Flynn, of Rutland-place, in the county of Cork, for improvements in paddle-wheels.—October 1.
33. Moses Poole, of Serle-street, for improvements in the manufacture of pails, tubs, baths, buckets, measures, drinking and other vessels, basons, pitchers, and jugs, by the application of a material not hitherto used in such manufactures.—October 1.
34. Robert Beart, of Godmanchester, for improvements in the manufacture of bricks and other articles through moulding orifices.—October 1.
35. Thomas Huckvale, of Choice-hill, near Chipping Norton, farmer, for improvements in instruments for administering medicine to horses and other animals.—October 1.
36. James Hare, of Birmingham, for improvements in expanding-tables and in music-stools.—October 1.
37. Moses Poole, of Serle-street, for improvements in covering and sheathing surfaces with a material not hitherto used for such purposes.—October 1.
39. Felix Abate, of George-street, Hampstead-road, and John Julius Cléro de Clerville, of Newman-street, for improvements in preparing, ornamenting, and printing on surfaces of metal and other substances.—October 1.
40. Frederick Richard Holl, of Weymouth-terrace, City-road, for improvements in watches and chronometers.—October 1.
41. Joseph Barrans, of Queen's-road, in the county of Surrey, for improvements in steam-engine boilers.—October 1.

43. Moses Poole, of Serle-street, for improvements in harness, and in horse and carriage furniture.—October 1.
45. Charles William Rowley Rickards, of the New-cut, Blackfriars-road, for improvements in tongs for screwing pipes and tubes.—October 1.
46. James Stewart, of Old St. Pancras-road, for improvements in the action of piano-fortes.—October 1.
47. Stephen Perry, of Red Lion-square, for improvements in ink-stands or ink-holders.—October 1.
48. Edmund Morewood and George Rogers, both of Enfield, for improvements in rolling metal.—October 1.
49. Edmund Morewood and George Rogers, both of Enfield, for improvements in coating metals.—October 1.
57. John Joseph Macdonnell, of the Temple-mead, Bristol, for certain improvements in the construction of railways.—Oct. 1.
59. Marcus Davis, of Lyon's-inn, Strand, for certain improvements in the manufacture of carriages, carts, military and other waggons, and wheels for locomotive and other purposes.—October 1.
75. Laurentius Mathias Eller, of Leadenhall-street, for an apparatus to release or separate carriages on railroads in case of accident, giving at the same time a signal of distress.—October 1.
84. Edwin Pettitt, of Kingsland, for improvements in the manufacture of ammoniacal salts and manures.—October 1.
86. David Dunne Kyle, of Albany-street, for an improved method of excavating and removing earth.—October 1.
113. Bernhard Harczyk, of Saint Mark-street, Tenter-ground, Goodman's-fields, for an improved preparation or composition of coloring matter, to be used in washing or bleaching linen and other washable fabrics, and in the manufacture of paper and other substances.—October 1.
120. George Collier, of Halifax, mechanic, for improvements in the manufacture of carpets and other fabrics.—October 1.
121. John Lee Stevens, of Kennington, for improvements in furnaces.—October 1.
122. Duncan Bruce, of Canada, for improvements in rotary steam-engines.—October 1.
123. Richard Whytock, of Greenpark, Zibberton, for improvements in the manufacture of fringes, and of pleat, for these and other ornamental work.—October 1.
124. Richard Husband Heighway, of the New-road, for improvements in paving roads and other surfaces.—October 1.
125. Thomas Hunt, of Leman-street, gun-maker, for improvements in fire-arms.—October 1.
127. Robert W. Parker, of Roxbury, Massachusetts, United States of America, for a new or improved mode of giving rotatory motion to a shaft of a circular saw or other mechanical contrivance.—October 1.

129. Joseph Cox, of Heston, for improvements in the manufacture of gates and hurdles.—October 1.

130. Isaac Westhorpe, of George-yard, for improvements in grinding wheat and other grain.—October 1.

136. William George Nixey, of Moor-street, for improvements in tills and other receptacles for money.—October 1.

137. Arthur Jackson, of Exchange-court, Liverpool, for improvements in gas-burners.—October 1.

141. Astley Paston Price, of Margate, for improvements in the manufacture of citric and tartaric acids, and of certain salts of potash, soda, ammonia, lime, and baryta.—October 1.

146. Edwin Lewis Brundage, of Jewin-crescent, for improved machinery for forging nails, brads, and screw-blanks.—October 1.

160. Joseph Burch, of Crag Hall, near Macclesfield, carpet manufacturer, for certain improvements in building and propelling ships and vessels.—October 2.

162. John Ignatius Fuchs, engineer, of Zerbst, Duchy of Anhalt Dessau, for an electro-magnetic apparatus.—October 2.

163. Moses Poole, of Serle-street, for improvements in the manufacture of tables, sofas, bedsteads, stands, chairs, and other articles of furniture, and the frames and bodies of musical instruments.—October 2.

167. Joseph Faulding, of Edward-street, Hampstead-road, for improvements in machinery for sawing and cutting wood and other substances.—October 2.

169. Moses Poole, of Serle-street, for improvements in machinery for mowing and reaping.—October 2.

184. Joseph Needham, of Piccadilly, gun manufacturer, for imimprovements in breach-loading fire-arms, and in apparatus connected therewith.—October 2.

191. John Stringfellow, of Chard, for improvements in galvanic batteries, for medical and other purposes.—October 2.

192. George John Philps, of Friday-street, for improvements in hats and other like coverings for the head.—October 2.

195. George Stuart, of Glasgow, merchant, for improvements in treating the fleeces of natural coverings of sheep and other animals when on the animals.—October 2.

204. Bendix Ising Jacoby, of Hamburgh, dentist, for improvements in the means of fixing artificial teeth.—October 4.

206. John Moseley, of Birmingham, engineer, for certain improvements in machinery for cleansing linen and other fibrous materials.—October 4.

211. Thomas Scott, of Drummond-street, for improvements in applying and transmitting motive power, and in accelerating the progress of bodies in motion.—October 4.

212. Thomas Slater, of Somer's-place, New-road, and Joseph John William Watson, of Old Kent-road, for improvements in the application of electricity to illuminating purposes.—October 4.

221. William Crosskill, of Beverley, for improvements in machines for cutting or reaping growing corn, clover, and grass.—October 5.

230. James Bullough, manufacturer, David Whittaker, overlooker, and John Walmsley, mechanical designer, all of Blackburn, for improvements in sizing machines.—October 5.

232. John Prestwich, the elder, Samuel Prestwich, and John Prestwich, the younger, all of Tamworth, spinners, for improvements in machinery or apparatus for cleaning and finishing woven fabrics.—October 5.

243. Samuel Getley, of Ivy-street, Birkenhead, for improvements in water-closets.—October 5.

244. Joseph Westby, of Nottingham, for improvements in machinery applicable to the manufacture of lace and other weavings.—October 5.

245. William Dray, of Swan-lane, for improvements in machinery for reaping and mowing.—October 5.

246. George Hallen Cottam, of Charles-street, Hampstead-road, for improvements in chairs, sofas, and bedsteads.—October 5.

247. Christopher Nickels, of York-street, Lambeth, and Frederick Thornton, of Leicester, for improvements in weaving.—October 5.

250. William Armand Gilbee, of South-street, Finsbury, for an improved mode of disinfecting putrified and fecal matters, and converting fecal matters into manure; also applicable to the disinfection of cesspools, drains, sewers, and other similar receptacles.—October 6.

265. David Collison, of Preston, cloth looker, for improvements in the construction of shuttle-skewers.—October 6.

271. Joseph Westby, of Nottingham, for improvements in twist lace machinery.—October 6.

272. Joseph Hill, of Birmingham, stamper, for a machine for stamping metals and forging iron and steel.—October 6.

273. John Frederick Chatwin, of Birmingham, for improvements in the manufacture of brushes.—October 6.

274. John Frederick Chatwin, of Birmingham, for improvements in the manufacture of buttons.—October 6.

275. Alphonse René le Mire de Normandy, of Judd-street, for improvements in obtaining fresh water from salt water.—October 6.

276. Francis Warren, of Millbank-street, for improvements in gas-burners.—October 6.

277. Admiral the Earl of Dundonald, of Belgrave-road, for improvements in coating and insulating wire.—October 6.

278. William Adolph, of Bury-court, St. Mary Axe, for improvements in apparatus for warming and ventilating rooms.—October 6.

295. Peter Ward, of Oldbury, for improvements in the manufacture of sal-ammoniac and obtaining salts of ammonia.—October 7.

297. Alfred Kent, of Chichester, for improvements in glazing.—October 7.

300. Professor Andrew Crestadoro, of Adelphi-place, Salford, for certain improvements in impulsoria, or machinery for applying animal power to railways, waterways, and common roads, and to other mechanical purposes;—part of which improvements relate to railways and other carriages, to buffers, springs, brakes, and chains; and in the propelling vessels across liquid elements.—October 8.

308. John Lewthwaite, of Halifax, for improvements in cards and tickets, and in machinery for cutting, printing, numbering and marking cards, tickets, and paper.—October 8.

315. Alexander Clark, of Gate-street, Lincoln's-inn-fields, and Patrick Clark, of the same place, for improvements in the manufacture of shutters, doors, and windows.—October 9.

327. Jonas Lavater, of Paris, for improvements in the apparatus for measuring the inclination of plane surfaces and angles formed or to be formed thereon.—October 9.

335. Robert Cochran, of Glasgow, potter, for improvements in kilns.—October 11.

336. Charles Matthew Barker, of Portsmouth-place, Kennington-lane, for improvements in sawing wood.—October 11.

337. Henry McFarlane, of Lawrence-lane, for improvements in stoves or fire-places.—October 11.

338. Robert Lambert, of Goree Piazza, Liverpool, for improvements in tents.—October 11.

357. Thomas Barnabas Daft, of the Isle of Man, for improvements in inland conveyance.—October 12.

358. William H. Smith, of the county of Montgomery, Pennsylvania, America, for improvements in the manufacture of lava ware.—October 12.

363. John Carter, of Meltham, spinner, for improvements in the manufacture of woven fabrics.—October 13.

376. Henry McFarlane, of Lawrence-lane, for improvements in constructing metal beams or girders.—October 13.

382. William Chisholm, of Holloway, chemist, for improvements in the purification of gas, and the obtention of certain products during the process of such purification.—October 14.

389. James Webster, of Leicester, engineer, for improvements in the construction of springs.—October 14.

390. John Swindells, of Pollard-street, Manchester, and William Nicholson, of Manchester, for improvements in obtaining oxygen gas, and applying it in the manufacture of various acids and chlorine, for oxydating metallic solutions, and for ageing and raising various coloring matters.—October 14.

392. Joseph Burch, of Crag Hall, near Macclesfield, for certain improvements in baths and bathing.—October 15.

393. Joseph Burch, of Crag Hall, near Macclesfield, carpet manufacturer, for certain improvements in building ships and

vessels, for the purpose of saving lives and property in cases of shipwreck or fire at sea.—October 15.

399. Joseph Hopkinson, the younger, of Huddersfield, engineer, for improvements in steam-boilers.—October 15.

400. Simon Pincoffs, of Manchester, and Henry Edward Schunck, of Rochdale, for improvements in the treatment of madder and other plants of the same species, and of their products, for the purpose of obtaining dyeing materials.—October 15.

412. John Howard, of Bolton, for certain improvements in the construction of steam boilers or steam generators.—October 16.

413. Charles Tiot Judkins, of Britannia Works, Manchester, for improvements in machinery or apparatus for sewing or stitching.—October 16.

415. William Beckett Johnson, of Manchester, engineer, for improvements in stationary steam-engines.—October 16.

419. John Henry Johnson, of Lincoln's-inn-fields, for improvements in the manufacture and applications of hyposulphite and similar compounds of zinc.—October 16.

420. John Oliver York, of Paris, engineer, for improvements in connecting and in fixing rails in railway chairs.—October 16.

432. Edwin Heywood, of Glasburn, for improvements in looms.—October 18.

440. Fennell Herbert Allman, of Westbourne-street, Hyde-park, for certain improvements in the manufacture and construction of brushes.—October 19.

441. John Kealey, of Oxford-street, agricultural implement maker, for improvements in machinery or apparatus for cutting or slicing roots.—October 19.

446. Robert Bird, of Crewkerne, for improvements in the straining webs of saddles.—October 19.

448. James Otams, of Camden-road, Holloway, for improvements in the manufacture of manure.—October 19.

451. Robert Brown, of Manchester, for certain improvements in the method of ventilating buildings or apartments, and in the apparatus connected therewith.—October 20.

452. John Carnaby, of St. John-street, for apparatus for turning, managing, and regulating the main taps of gas pipes laid on to houses or buildings, at a part of the house or building distant from the main tap.—October 20.

453. Frederick Richards Robinson, of Charlestown, Massachusetts, America, for an improvement in the gridiron, or instrument for cooking steaks or other articles by broiling.—October 20.

464. John Gilbert, of Wardour-street, and Samuel Nye, of the same place, for improvements in mincing meat and other substances.—October 20.

466. Robert Burns, of Liverpool, and Richard Pritchard Willett, of the same place, for certain improvements in machinery or apparatus for cutting bones.—October 20.

469. Robert Hoppen, of Plymouth, for improvements in apparatus for mincing meat.—October 21.
474. William Weild, of Manchester, for improvements in looms for weaving certain descriptions of pile fabrics.—October 21.
480. John Fowler, of Bristol, for improvements in machinery for draining land.—October 21.
481. John Fowler, of Bristol, for improvements in laying wires for electric telegraphs.—October 21.
482. John Fowler, of Bristol, for improvements in reaping machinery.—October 21.
483. John Fowler, of Bristol, for improvements in machinery for sowing seed and depositing manure.—October 21.
487. Archibald Slate, of Dudley, civil engineer, for certain improvements in the manufacture and construction of cores and core-bars, used in the production of hollow castings in iron and other metals.—October 22.
489. Peter Armand le Comte de Fontainemoreau, of South-street, Finsbury, for improvements in apparatus for *essaying* silk, cotton, and other similar fibrous substances.—October 22.
491. James Wilson, of Walbrook, for improvements in printing fabrics of silk or partly of silk.—October 22.
493. George Price, of Birmingham, stove manufacturer, for a new or improved gas stove.—October 23.
507. Felix Lieven Bauwens, of Croydon, chemist, for improvements in treating fatty matters, prior to their being manufactured into candles and mortars, which are also applicable to oils.—October 23.
509. Charles Watson, of Rhodes-street, Halifax, for improvements in ventilation.—October 23.
510. John Taylor, of Manchester, engineer, and James Slater, of the same place, Gent., for certain improvements in machinery, apparatus, or implements for weaving.—October 23.
523. William Clark, of Manchester, engineer, for improvements in joints for connecting metals.—October 26.
528. Halsey Draper Walcott, of Boston, Massachusetts, America, for a new and useful or improved mechanism or contrivance for cutting button-holes or slits in cloth or other material.—October 26.
532. John Lee Stevens, of Kennington, for improvements in furnaces.—October 27.
533. Anthony Fothergill Bainbridge, of Putney, for improvements in the manufacture of artificial flies and other bait for fish.—October 27.
534. Samuel Clarke, of Albany-street, Regent's-park, for improvements in the manufacture of candles.—October 27.
549. Bryan Donkin the younger, of Bermondsey, engineer, and Barnard William Farey, of Commercial-road, engineer, for improvements in the machinery for measuring or marking off long lengths or continuous webs of paper or other materials

into any required lengths, for the purpose of being cut or otherwise disposed of.—October 28.

554. John Collis Browne, surgeon, at Fort Pitt, Chatham, for an invention for the relief of individuals suffering from pulmonary affections or diseases of the chest.—October 28.

556. Charles Arthur Redl, of Davis-street, Berkeley-square, for improvements in telegraphing or communicating signals at sea and otherwise.—October 28.

557. Robert Mallet, of Dublin, engineer, for improvements in fire-proof and other buildings and structures.—October 28.

558. Henry Robert Ramsbotham, of Bradford, and William Brown, of the same place, for improvements in preparing and combing wool and other fibrous substances.—October 29.

564. William Bates, of Leicester, fuller and dresser, for improvements in apparatus for getting-up stockings and other hosiery goods.—October 29.

565. William Henry Fox Talbot, of Lacock Abbey, Wilts, for improvements in the art of engraving.—October 29.

568. Richard Archibald Brooman, of Fleet-street, for improvements in tackle-blocks.—October 29.

570. Martin Watts, of Patricroft, for certain improvements in machinery or apparatus for roving or preparing cotton and other fibrous substances for spinning.—October 30.

574. John Gedge, of Wellington-street, Strand, for improvements in printing presses or machines.—October 30.

579. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for improvements in machinery for cutting corn and other standing crops.—October 30.

582. James Sinclair, of Stirling, North Britain, for improvements in engines to be worked by steam, air, or water,—the said improvements being also applicable to pumps.—October 30.

588. George Fergusson Wilson, of Belmont, Vauxhall, and Edward Partridge, of Wandsworth, for improvements in the instruments or apparatus used when burning candles.—October 30.

589. William Dantec, of Liverpool, for improvements in preventing incrustation in steam-boilers.—October 30.

592. George Dixon, of Dublin, soap and candle manufacturer, for an improvement in bleaching palm-oil.—November 1.

595. Joseph John William Watson, of Old Kent-road, and Thomas Slater, of the parish of St. Pancras, for improvements in galvanic batteries; and in the application of electric currents to the production of electrical illumination and of heat; and in the production of chemical products by the aforesaid improvements in galvanic batteries.—November 1.

600. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in the manufacture and treatment of oils.—November 1.

601. Julius Jeffreys, of Croydon, for improvements in obtaining power when steam or other vapour is used.—November 1.
602. John Chubb, of Saint Paul's Churchyard, for improvements in locks.—November 1.
617. John Macintosh, of Aberdeen, for improvements in the manufacture of paper.—November 2.
619. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in the preparation of materials for, and in the manufacture of candles and night-lights.—November 2.
620. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating wool in the manufacture of woollen and other fabrics.—November 2.
621. Bernhard Samuelson, of Banbury, for improvements in breaking up and tilling land.—November 2.
624. Edward Lord, of Todmorden, for improvements in certain machinery to be used in preparing, spinning, and weaving cotton and other fibrous substances.—November 3.
627. Alfred Augustus De Reginald Hely, of Cannon-row, civil engineer, for an improved shade or chimney for lamps, chandeliers, gas and other burners.—November 3.
632. Nehemiah Hodge, of North Adams, Massachusetts, America, for discharging water from the hold of a navigable vessel.—November 3.
635. Charles Pryse and Richard Redman, both of Birmingham, gun makers, for improvements in a certain description of fire-arms.—November 4.
644. George Shand, of Glasgow, and Andrew M'Lean, of Edinburgh, chemists, for improvements in obtaining products from tar.—November 5.
645. Peter Fairbairn, of Leeds, machinist, for certain improvements in self-acting reeling machinery for reeling flax and other yarns into hanks.—November 5.
646. George Fife, of Newcastle-upon-Tyne, Doctor of Medicine, for improvements in steam and water gauges.—November 5.
654. Richard Wright, of Greenwich, for improvements in shafts and plummer-blocks.—November 5.
655. Robert Booty Cousens, of Halliford-street, for improvements in machinery for cutting cork.—November 5.
656. Admiral the Earl of Dundonald, of Belgrave-road, for improving bituminous substances, thereby rendering them available for purposes to which they never heretofore have been successfully applied.—November 5.
657. John Melville, of Porchester-terrace, for improvements in the application of iron, and of wood combined with iron or other substances, to buildings and other constructions.—November 6.
659. John, Edward, and Charles Gosnell, of Three King-court, Lombard-street, for certain improvements in brushes.—November 6.

660. James Nichol, of Edinburgh, bookseller, for certain improvements in the process of graining or ornamenting surfaces and fabrics.—November 6.

662. Peter Fairbairn, of Leeds, and John Hargrave, of Kirkstall, for certain improvements in machinery for opening, combing, and drawing wool, flax, and other fibrous materials.—November 6.

664. John Arthur Phillips, of Upper Stamford-street, for improvements in purifying tin.—November 6.

665. Thomas Hicks Chandler, of Aldbourn, for improvements in hoes.—November 6.

666. Benjamin Baillie, of Wardour-street, for improvements in apparatus for drawing off and registering the flow of fluids. November 6.

667. William Frederick De la Rue, of Bunhill-row, and George Waterston, of Edinburgh, for improvements in writing cases.—November 6.

674. Peter Fairbairn, of Leeds, for certain improvements in the ordinary screw-gill machinery, when applied to the purposes of drawing, combing, and heckling fibrous materials.—November 8.

677. Andrew Robeson, jun., of Newport, Rhode Island, America, for an improved mode of bowking or bucking cloth.—November 8.

680. William Thomas Henley, of St. John-street-road, for certain improvements in electric telegraphs, and in the apparatus and instruments connected therewith.—November 9.

683. Jean Jacques Ziegler, of Guebwiller, France, engineer, for certain improvements in machinery for preparing to be spun cotton, wool, silk, silk waste, flax, tow, and other fibrous substances.—November 9.

685. Robert Knowles, of Chorlton-upon-Medlock, mechanic, for certain improvements in boilers and apparatus for generating steam.—November 9.

691. William Gossage, of Widnes, chemist, for improvements in obtaining sulphur from certain metallic sulphurets.—November 9.

694. Charles Griffin, of Leamington Spa, for improvements in apparatus for fixing type or printing surfaces in a chase.—November 9.

695. Robert Buncombe Evans, of Colyton, for improvements in the manufacture of charcoal.—November 9.

697. Obed Hussey, of Manchester, for improvements in reaping machines.—November 9.

702. Joseph Tringham Powell, of Fenchurch-street, for improvements in mixing, baking, and drying materials in the making of biscuits and other articles where plastic matters are employed.—November 10.

710. James Noble, of Leeds, for improvements in combing wool and other fibres.—November 11.

711. Colin Mather and William Wilkinson Platt, of Salford Iron Works, Salford, for improvements in machinery for finishing linen, cotton, and other fabrics.—November 11.

712. Christian Sharps, of Hartford, America, for improvements in breech-loading fire-arms.—November 11.

713. John Henry Johnson, of Lincoln's-inn-fields, for improvements in machinery or apparatus for sewing and stitching,—being a communication.—November 11.

719. Sir Charles Fox, Knight, of New-street, Spring-gardens, for improvements in roads,—a communication.—November 12.

726. John Henry Johnson, of Lincoln's-inn-fields, for improvements in reaping machines and in apparatus connected therewith,—being a communication.—November 12.

729. Thomas Day, of Upper Mall, Hammersmith, coal-merchant, for improvements in landing and screening coals, and delivering them into sacks.—November 12.

737. John Paterson, of Wood-street, warehouseman, for improvements in apparatus for shaping collars and other similar linen and cotton articles.—November 13.

738. Richard Coad, of London, and John Peers Coad, of Liverpool, for improvements in fire-places and means of applying heat.—November 13.

740. Admiral the Earl of Dundonald, of the Belgrave-road, for improvements in apparatus for laying telegraphic or galvanic wires in the earth.—November 13.

741. Samuel Sedgwick, of Piccadilly, for improvements in lamps. —November 13.

742. Hugh Greaves, of Salford, civil engineer, for improvements in the permanent way of railways.—November 13.

746. Joseph Cowen, of Blaydon Burn, and Thomas Richardson, of Newcastle-upon-Tyne, for improvements in the manufacture of sulphuric acid.—November 15.

747. Robert Reyburn, of Greenock, for improvements in the composition of lozenges and other confections.—November 15.

751. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for certain improvements in lamps,—being a communication.—November 15.

755. James Robertson, of Glasgow, for improvements in the manufacture of casks and other wooden vessels.—November 15.

759. Abraham Rogers, of Field House, near Bradford, for improvements in apparatus used for forming sewers, tunnels, and ways.—November 15.

760. John Dent Goodman, of Birmingham, for improvements in the boxes and axles for carriages,—being a communication.—November 15.

CELESTIAL PHENOMENA FOR FEBRUARY, 1853.

D.	H.	M.	
1			Clock before the ⊙ 13m. 56s.
	—		☽ rises 0h. 47m. M.
	—		☽ passes mer. 5h. 59m. M.
	—		☽ sets 10h. 59m. M.
	6	1	☽ in □ or last quarter
	15	0	☽ in Perigee
3	4	35	♀ in the descending node.
5			Clock before the ⊙ 14m. 21s.
	—		☽ rises 5h. 57m. M.
	—		☽ pass mer. 9h. 46m. M.
	—		☽ sets 1h. 34m. A.
	6	52	Vesta in conj. with ♄ diff. of dec. 2. 39. S.
	18	46	♀ in conj. with the ☽ diff. of dec. 2. 6. N
6	14	19	☿ in conj. with the ☽ diff. of dec. 1. 20. N.
7	5	23	♃'s first sat. will im.
	10	34	♂ in conj. with the ☽ diff. of dec. 2. 51. N.
8	5	34	Ecliptic conj. or ● new moon
9	5	14	♃'s third sat. will em.
10			Clock before the ⊙ 14m. 33s.
	—		☽ rises 8h. 52m. M.
	—		☽ pass mer. 2h. 10m. A.
	—		☽ sets 7h. 40m. A.
12			Juno in Perihelion
13	4	24	♃'s second sat. will im.
	15	6	♅ in conj. with the ☽ diff. of dec. 3. 51. N.
	17	20	♂ greatest hel. lat. S.
14	7	16	♃'s first sat. will im.
	17	5	♄ in conj. with the ☽ diff. of dec. 1. 29. N.
	21	0	☽ in Apogee.
15			Clock before the ⊙ 14m. 26m.
	—		☽ rises 10h. 15m. M.
	—		☽ pass mer. 5h. 42m. A.
	—		☽ sets 0h. 15m. M.
16	3	12	☽ in □ or first quarter
	6	56	♃'s third sat. will im.
17			Occul. *n* Tauri, im. 10h. 10m. em. 11h. 10m.
18	23	10	☿ in conj. with ♂ diff. of dec. 1. 5. S.
	—		Occul. 1, Geminorum, im. 5h. 5m. em. 6h. 10m.
	—		Occul. 3, Geminorum, im. 8h. 35m. em. 9h. 21m.
20			Clock before the ⊙ 14m. 1s.
	—		☽ rises 1h. 21m. A.
	—		☽ pass mer. 9h. 51m. A.
	—		☽ sets 5h. 23m. M.
	9	23	☿ greatest hel. lat. S.
	—		Occul. in Cancri, im. 11h. 42m. em. 12h. 2m.
21	6	19	Juno in conj. with ♅ diff. of dec. 10. 30. S.
23	7	24	Ecliptic oppo. or ○ full moon
24			Occul. *ν* Virginis, im. 10h. 31m. em. 11h. 37m.
25			Clock before the ⊙ 13m. 19s.
	—		☽ rises 7h. 48m. A.
	—		☽ pass mer. 1h. 23m.
	—		☽ sets 8h. 3m. M.
	21	33	☿ in sup. conj. with the ⊙
26	20		☽ in Perigee.

J. LEWTHWAITE Rotherhithe.

THE

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CONJOINED SERIES.

No. CCLV.

RECENT PATENTS.

To Henry John Gauntlett, *of Charlotte-street, Portland-place, in the county of Middlesex, Doctor in Music, for improvements in organs, seraphines, and other similar wind instruments; and also improvements in piano-fortes,—being partly a communication.*—[Sealed 15th July, 1852.]

This invention has reference, firstly, to a mode of simplifying the construction of finger and pedal organs, by dispensing with the complex mechanism heretofore required for transmitting the movement of the keys or the pedals of organs to the pallets or valves which admit the wind from the wind-chest to the various organ-pipes. In carrying out this part of the invention, an electric circuit is established between the pallets and the keys and pedals, respectively; and, by transmitting an electric current, on the depression of a key, to a bar of soft iron (forming a temporary magnet), in connection with the pallet which is required to be opened, a sufficient motive power is obtained to open the pallet or valve, and produce the note required to be sounded, without the intervention of rollers, backfalls, squares, &c., at present used. By this means the patentee also avoids the deep fall of the key, and the heavy pressure therefrom. The arrangement of the apparatus for conveying and applying the electric current may be varied, as circumstances may require; and the electric current itself may be either voltaic, galvanic, magneto-electric, induced magnetic, or thermo-electric. It is also proposed to apply this means of communicating motion to parts of organs,

for drawing and shutting off the stops; for coupling them with any two or more of the key-boards, or with the pedals; throwing them out of connection; and likewise for working the shutters of the swell-box.

The invention refers, secondly, to the opening of the valves or pallets of self-acting or barrel-organs, seraphines, and other free-reed instruments, and also to the striking of the hammers of piano-fortes, without the intervention of keys, in connection with the pallets or hammers. This action is effected by causing the notation (whether it be metal pins, or other known means that are used), as it is brought forward, to bring the magnet of the valve or hammer which is to be acted upon within the electric circuit, and thereby to cause the valve to open and admit wind into its pipe, or the hammer to strike upon its string and produce the note required.

In Plate VI., fig. 1, shews, in sectional elevation, one mode of connecting the keys with the valves of the wind-chest. Under the keys of the key-board, and running from end to end thereof, is placed a bar of metal *a*, connected, by a copper wire, with one pole of the battery. Every key *b*, is provided with a pin *c*, which passes through it, and projects downwards, for the purpose of making contact with the bar *a*. The lower end of a small spiral spring *d*, pendent from a fixed bar *e*, is attached to this pin *c*, and answers the double purpose of conducting the current and of returning the key from its depressed to its elevated position. From this spring a wire *f*, passes to one end of an electro-magnet *g*, placed in the wind-chest, so as to command the valve or pallet answering to the note which the key is intended to sound. The wire from the other end of the magnet *g*, is connected with the return-wire *h*, for all the magnets. An armature *i*, of soft iron, or other metal capable of magnetic induction, is fixed on the valve *k*, in the wind-chest, near to the magnet. When, therefore, the player depresses the key *b*, the pin that passes through the key makes contact with the bar beneath, and allows the current to pass from the battery to the magnet *g*, which, attracting the armature on the valve *k*, opens that valve, and allows the wind to blow into the pipe immediately above it; and, so long as the key is held down by the performer, the valve will remain open. On the rising of the key, the contact is broken, and the valve is closed by an ordinary spring.

It will now be understood, that the pallets or valves of each wind-chest are severally connected with the keys of their respective key-boards; when therefore, for example, the key C,

of the choir-organ is depressed, all the pipes in the same range, whose stops are drawn, will be caused to speak. In order to effect the drawing and the shutting off of the stops, the patentee provides an arrangement of parts very similar to that already described for opening the valves; but that a sufficient length of motion of the sliders may be obtained, so as fairly to open and cut off the communication of the pipes with their wind-chests, he prefers to mount the armature on the short limb of a crank-lever, and connect the long limb of the same to the slider: by which means, the slight movement of the shorter limb, when drawn into contact with the electro-magnet, will cause the longer limb to move through any given distance, and traverse the slider sufficiently far to draw or shut off the stop or group of pipes which it commands. The circuit, in this instance, may be completed by the depression of a key, or any analogous contrivance; but it should be understood that, as the sliders are required to be drawn and returned to their former position, it will be convenient to have a duplicate arrangement of electro-magnets and armatures for each slider.

The means whereby the full organ may be brought under the command of one set of keys are as follows:—Fig. 2, is a cross section of the great organ key-board. *a, a,* are the keys, carrying, at their under side, metal pins *b, b,* equal in number to the organs which the instrument contains (in this case four are shewn). Below the keys are four metal bars *c, c,* connected, respectively, to the batteries which are provided for working the several organs. A metallic connection is established between the pins *b, b,* of each key and a metallic cord *d,* by four metallic springs *e, e,* which answer the same purpose as the coiled spring in the former arrangement. This cord *d,* is composed of a corresponding number of insulated strands or wires, which lead off to the several organs, and are connected to electro-magnets, which severally command the same note in the octave, and are intended, on the depression of the key, to sound that note simultaneously. It will now be understood that, so long as the connection between the bars *c, c,* and their batteries is maintained, the depression of the key will complete four electric circuits simultaneously; and, supposing the batteries to be in action, the result already explained with reference to fig. 1, will be obtained in each organ. The pedal-board may be fitted with a like arrangement, if thought desirable, so as to bring any or all of the organs under the command of the pedals. As the application of this part of the invention to finger-seraphines, and other

free-reed instruments, is similar to that just described with reference to organs, no further explanation on that head will be requisite.

To allow of the gradual opening of the shutters of the swell-box, the patentee hangs the shutters so that they may act independently of each other; and, in place of the ordinary lever, worked by the foot, he brings an electro-magnet in connection with each shutter; then, by means of studs in or near the key-slips (or in any other convenient position), or by the depression of a key or pedal, he completes the circuit of the battery through one or more electro-magnets, and opens one or more shutters at pleasure,—whereby a much slower and more gradual *crescendo* is obtained than by the ordinary swell arrangement.

The electro-magnets and armatures may be worked in conjunction with the apparatus known as the pneumatic-lever,—the valve, in that case, being opened in a manner similar to those already described.

In place of the armature being fixed on the valve, the electro-magnet may be affixed to the valve, and the armature placed within the wind-chest beneath. This position would be the reverse of the one above described. In case more than one battery is used for the same organ, the conducting surface *a*, fig. 1, under the key-board of that organ, must not be continuous, but must be composed of as many pieces as there are batteries.

Fig. 3, is a partial sectional elevation and fig. 4, a plan view of a barrel-organ, which is intended to be worked by electric currents, according to the second part of this invention. *a*, is a metal barrel, fitted with pins or metallic projections, in the manner common to barrel-organs; and it is connected, through its shaft, or otherwise, with one pole of a battery. The other pole of this battery is connected, by means of wires, with one end of a series of electro-magnets *b*, which are situated, as in the former arrangement, in the wind-chest, and are intended to open their respective valves *c*, (fig. 3,) placed immediately above them. A wire from the other end of each magnet leads to a narrow strip of metal, or a metal spring *d*, set over the barrel, and in a line with one of the rings of pins or projections with which the periphery of the barrel is fitted; when therefore, by the revolution of the barrel, a pin is brought into contact with a spring *d*, a metallic circuit is completed, and the magnet in that circuit will draw down its pallet or valve and sound the note which corresponds thereto. It will be understood, that pegged

boards, or other analogous contrivances, may be employed in lieu of the barrel, and that a precisely similar arrangement to that above described may be applied to seraphines and other free-reed instruments.

Fig. 5, shews a similar arrangement of magnetic apparatus, applied to actuate the hammers of a piano-forte. *a*, is a metallic barrel, properly fitted with metallic projections, answering to certain tunes required to be played. A copper wire leads from this barrel to one pole of a battery; while the other pole of the battery is connected to a series of electro-magnets *b*, which, as in the former arrangement, are severally connected to a spring-bar *d*, that rides over its ring of pins on the barrel, as the barrel revolves. Beneath each magnet is a lever *e*, which carries an armature, and also a hopper *f*, for throwing the hammer into contact with the strings of the instrument. A current of electricity being passed through the coils of the magnet, on the completion of the circuit, the lever *e*, will be suddenly raised, and the hopper will thereby be made to throw up the lifting-rod *g*, and cause the hammer *h*, to strike the note required.

The patentee claims, as his improvements in finger and pedal organs, seraphines, and other similar wind instruments, First,—the means herein described, or any mere modification thereof, for transmitting the movements of the keys and pedals to the valves or pallets, whereby the use of stickers, backfalls, squares, trackers, and rollers, is avoided. Secondly,—the means herein described, or any mere modification thereof, for drawing and shutting off the stops, and for opening the shutters of the swell-box. Thirdly,—the means herein described, or any mere modification thereof, for opening the valves of barrel or self-acting organs, seraphines, and other free-reed instruments, and for throwing the hammers of piano-fortes into action.—[*Inrolled January*, 1853.]

To ALFRED VINCENT NEWTON, *of the Office for Patents*, 66, *Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in machinery for combing wool and other fibrous substances,—being a communication.*—[Sealed 8th March, 1852.]

THIS invention refers to certain mechanical arrangements, constituting an improved machine for combing wool and other fibrous materials.

In Plate V., fig. 1, represents the machine in front ele-

vation; fig. 2, is a left-hand elevation; fig. 3, a right-hand elevation of the same; and fig. 4, is a partial cross section, taken in the line 1, 2, of fig. 1. Fig. 5, is a sectional view, representing a modification of the combing apparatus. The chief features of the invention may be thus enumerated:—In this improved machine, the wool to be combed is lapped or deposited on to travelling combs, having one or more rows of teeth, attached by short bars to the links of an endless chain, which passes over rollers or wheels, mounted at opposite ends of the machine. In the upper part of their course these combs are guided, so as to move in a straight line, to receive the fibres of wool from a feeding apparatus and carry it along in front of a combing apparatus, and thence to a pair of rollers, which draw off the combed fibres to form a sliver.

This invention consists in depositing the wool, as it is taken up by the feed-rollers from an apron, by giving to the frame, which carries the feeding apparatus, a motion derived from a crank, or the equivalent thereof, at or near one end, and from vibrating rods or rockers at or near the other; so that the feeding apparatus shall gradually move towards the range of comb-teeth and gradually descend, to lay the fibres on the teeth of the main comb, and then recede therefrom and again rise, preparatory to a repetition of the operation. It also consists in combining with the feed-rollers, a rod, placed in front of and parallel therewith; which rod is connected with the feeding apparatus, and has a motion, relatively thereto, upwards, as the rollers advance the fibres of wool, to lift them up, and downwards, to separate the fibres on the main comb from those in the bite of the feed-rollers. The invention further consists in giving an intermittent motion to the feed-rollers, so that, between each action, the required quantity of wool may be fed forward, and remain at rest during the combing action. It also consists in combining with the main comb and condensing apparatus the employment of a vibrating finger, having a motion, such as would be given by jointing one end of the wire, constituting such finger, to the edge of an endless belt passing around two rollers, for the purpose of carrying the fibres of wool that have been combed towards the rollers of the condensing apparatus, and presenting them properly to the bite of such rollers, to ensure the catching of the longest fibres first. And, finally, the invention consists in the employment of a rotating wheel or brush, which acts against the front face of the main comb-teeth, after they have passed the combing cylinder, for the purpose of lifting the fibres, or properly loosening them from the base of the teeth.

a, is the frame of the machine; and *b*, is a feeding-apron, whereon the wool, to be combed, is placed by an attendant, and by which it is regularly fed, and presented to the bite of a pair of feed-rollers *c*. The apron *b*, passes around two rollers, one at each end, in the usual manner of operating feed-aprons; and the forward one of these rollers, and the feed-rollers *c*, are geared together by a train of cog-wheels, so that they shall move together, and with equal velocity. The feed-rollers are on the end of a vibrating frame *h*, which, near this end, is suspended from the crank *i*, of a shaft *j*; and the rear end of the frame is supported on two rocking-arms *k*; so that, by the rotation of the crank, the end of the frame, which carries the feed-rollers, describes an ellipse in its motion, and thereby the wool, that is drawn through by the feed-rollers, is carried to and laid on to the teeth of the comb to be presently described.

The intermittent feeding motion is communicated to the apron and feed-rollers, whilst the vibrating frame is advancing towards the comb-teeth, by a small crank *l*, on the end of the crank-wrist that works the vibrating frame. This said crank *l*, works in a slot at the upper part of a rack-bar *n*, formed at right angles to the line of the said rack-bar, which slides in appropriate boxes attached to the frame. The cogs of the rack engage the cogs of a wheel *o*, that turns freely on the arbor of a ratchet-wheel *p*; which arbor also carries a cog-wheel in connection with the train of wheels that drives the feed-apron and feed-rollers. The cog-wheel *o*, is provided with a spring driving-click or pawle *r*; so that, when the rack-bar is carried down by the crank, the spring driving-click engages the teeth of the ratchet-wheel *p*, and imparts the feed-motion; and, as the said bar rises, the click is carried back without moving the ratchet-wheel.

As the wool is moved out by the rollers, it is lifted, so as to be in a proper condition to be laid on to the comb-teeth, by means of a rod *s*, parallel with, and just in front of, the feed-rollers. This rod is attached to an arm *t*, that vibrates on the stud of the ratchet-wheel *p*, and which is operated by being connected with the rack-bar *n*; so that, as the feed-rollers carry the wool forward, the rod rises, in order to lift it; and, as the wool is carried down to the comb-teeth by the downward motion of the vibrating frame, the rod descends, to separate the fibres deposited on the teeth of the main comb from those remaining under the bite of the feed-rollers. Another object of lifting the wool by the rod *s*, is to hold it whilst the teeth of a vibrating comb *u*, are carried down through it.

This comb is placed between the rod *s*, and the feed-rollers, and is attached to the outer ends of arms *v*, *v*, projecting from a rock-shaft *w*, hung in the vibrating frame *h*; and this shaft *w*, has another arm *x*, furnished with a pin that works in an excentric groove in the side of a cam *y*, on the crank-pin which vibrates the frame *h*. This groove is formed so as to cause the comb *u*, to descend and engage the wool, as it is being lapped on to the main comb-teeth; so that, during the back movement of the vibrating frame with the feed-rollers, the fibres of wool may be partially combed, and those lapped on to the teeth of the main comb effectually separated from those still in the bite of the feed-rollers.

The main comb a^1, is composed of two rows of parallel teeth (more or less), secured to a series of bars b^1, which are attached, at about the middle of their length, to the links of a chain c^1, that passes around two wheels d^1, e^1, provided with side flanches to embrace the chain. The wheel d^1, turns freely; but the other e^1, is keyed to a shaft f^1, which carries a bevil cog-wheel g^1, driven by a pinion h^1, on a shaft i^1; and this shaft i^1, in turn, receives motion through a cog-wheel j^1, pinion k^1, and band-wheel l^1, from the main driving-shaft m^1. The bars b^1, that carry the comb-teeth, are maintained in a straight line along the upper part of their course by sliding on and against a bar n^1, of the frame, which is rebated for that purpose, and extends from the wheel d^1, to the wheel e^1; and the bar n^1, is also grooved to receive and guide the chain which carries the bars b^1, of the comb. The chain of combs below is guided by a wheel o^1, the shaft whereof is mounted in brackets *z*, in such manner that it can be adjusted for the purpose of keeping the chain properly distended.

The wool, which is lapped on to the teeth of the main comb, is gradually carried by the forward motion of the chain to and in front of a combing cylinder *d*, provided with bars *e*, that carry tangential combs *f*, by which the wool is properly combed. The cylinder *d*, receives motion by a strap *g*, from a pulley on the main shaft; and from the shaft of this cylinder motion is communicated by a train of cog-wheels *m*, *m*, to the shaft *j*, which carries the crank that vibrates the frame *h*, of the feeding apparatus. The combing-cylinder is provided with rotating brushes or card-rollers *q*, in the usual manner, for clearing the teeth of the combs as the cylinder rotates.

After the fibres of wool, which hang on the main comb-teeth, have passed the combing-cylinder, they are carried towards a pair of vertical fluted rollers a^2, a^2, placed near the main comb. The shaft of one of these rollers runs in fixed

boxes, and carries a pulley b^2, which receives motion by a band c^2, from a pulley on the main driving-shaft; and the shaft of the other roller runs in moveable boxes, provided with helical springs d^2, d^2, which keep the two rollers properly in contact to bite the fibres of wool. The hanging fibres of wool, as the chain of combs moves along, are caught by these rollers and are stripped off from the comb-teeth; but it is important to the proper operation of this part of the machine that the rollers should catch the outer ends of the fibres first; and, for this purpose, there is provided a wire finger e^2, jointed near its lower end to an endless strap or chain f^2, that passes around two rollers g^2, g^2; one of which is a guide-roller, and the other a driving-roller,—the shaft of the latter being provided with a band-wheel, which receives motion by a band from a pulley on the main driving-shaft. The upper end of the wire e^2, slides freely in a swivel h^2, so that as the endless band that carries this wire travels at a greater velocity than the chain of combs, the wire catches the fibres of wool and carries the loose ends towards the bite of the rollers; and thus the longest ends are first caught by the rollers and drawn from the comb-teeth; and so, in succession, all the fibres of sufficient length are drawn off in the form of a sliver, and delivered by the rollers to a condensing tube l^2, which receives motion by a band from a pulley on the shaft of the driving-roller g^2. The condensing tube delivers the sliver to a pair of fluted rollers n^2, n^2, which are driven, by means of a strap, from the main driving-shaft. The boxes of the rollers a^2, a^2, are attached to a frame or plate p^2, which slides vertically in ways q^2, so that the frame and its rollers are free to move up and down; and this frame or plate is provided with an arm r^2, the end whereof rests on the periphery of a cam s^2, attached to a cog-wheel t^2, which receives motion from a worm u^2, on the shaft i^1. The form of this cam is represented by dotted lines in fig. 1; and the object is to give a slow up-and-down motion to the rollers, as they draw the fibres from the teeth of the main comb, to ensure the catching of all the fibres which are of sufficient length. As the fibres are passing along in front of the wire finger, which presents them to the rollers, it is important that they should be lifted from the base of the comb-teeth, because the action of the combing-cylinder tends to draw them down, and causes them to accumulate and clog the teeth, so as to prevent the rollers drawing them off without breaking. To loosen them, there is provided a wheel v^2, (a brush may be used instead), the periphery of which is covered with leather, or its equivalent; and it runs in contact,

or nearly so, with the base of the comb-teeth, and, acting on the fibres, forces them up from the base of the comb-teeth. This wheel or brush receives motion through a series of cog-wheels from the shaft i^1, that communicates motion to the chain of combs.

Instead of employing the combing-cylinder for combing the wool as it passes along from the feeding to the condensing apparatus, a vibrating comb, worked in substantially the same manner as the comb connected with the feeding or lapping apparatus, may be used. This comb may be constructed in the manner shewn at fig. 5, where the comb-teeth *a*, are arranged on a bar *b*, attached to the arms *c*, of a rock-shaft *d*, jointed to two rocking-arms *e*, that vibrate on fixed studs *f*. This rock-shaft *d*, is provided with another arm *g*, connected to a crank-pin *h*, on the arm of a shaft *i*, which receives the required motion from any appropriate part of the machine. The dotted line *j*, represents the curve generated by the points of the comb-teeth, as they are carried back from the main comb a^1; from which it will be seen, that the combing action, after the teeth have entered the wool, is more direct than with a combing-cylinder. This comb may be attached to the vibrating frame of the feeding apparatus, from which it will receive the required motion.

It may be remarked, that the use of the feed-apron is not indispensable, as the wool can be presented to the feed-rollers without the apron. And it should be also understood, that the required heat can be applied to this machine in any suitable manner, by means of steam-pipes, or by making some parts of the machine hollow for the passage of steam.

The patentee claims the general arrangement of machinery, as above described, for combing wool and other fibrous materials; and particularly he claims, First,—giving to the feeding apparatus the motion substantially as specified, for depositing the fibres of wool on to the teeth of the main comb, as described. Secondly, in combination with the feed-rollers, operated substantially as specified,—the employment of the lifting-rod, for lifting the fibres preparatory to depositing them on the main comb, as described. Thirdly, in combination with the feed-rollers and lifting-rod, substantially as specified,—the employment of a vibrating-comb, as described, for the purpose of effectually separating the fibres held by the feed-rollers from those deposited on to the teeth of the main comb, as specified. Fourthly, in combination with the endless chain of comb-teeth, constituting the main comb,—the vibrating-finger, operated substantially as specified, to direct the

fibres of wool (after they have been combed) to the draw-off-rollers, which deliver them to the condensing apparatus, as described. Fifthly,—giving to the feeding-rollers an intermittent motion, substantially as specified, that the required quantity may be fed forward, and remain at rest during the combing action, as specified. And, Finally,—giving to the draw-off-rollers, which strip the fibres of wool from the teeth of the main comb, a slow motion, in the direction of their axes, as specified.—[*Inrolled September*, 1852.]

To WILLIAM EARNSHAW COOPER, *of Mottram, in the county of Chester, tallow chandler, for certain improvements in the manufacture of candles and candle-wicks, and in the machinery or apparatus employed therein.*—[Sealed 2nd April, 1852.]

THIS invention consists chiefly in an alteration or improvement in the make or treatment of the candle-wick and a consequent improvement, ensuring a more steady illuminating power in the candle. The improved candle-wick is made by passing a portion of the strands, of which the wick is intended to be composed, through a solution made of bismuth and oil, or such other suitable solution or mixture as will have the effect of rendering the strand or strands so saturated more susceptible of combustion than the other remaining strand or strands; and then the whole of the strands are twisted together in the usual manner of twisting cord, twine, or other similar articles. The number of strands to be so saturated with bismuth and oil, or such other suitable solution or mixture, is usually one third: therefore, if a wick be composed of three strands, the third strand should be the only one treated; and so on, however numerous the strands used. When the candle is lighted, the prepared strand or strands will be presently exhausted, and so cause the wick to lean over on one side; the carbonized portion of the wick is thus given off imperceptibly, and the candle, or rather the wick, requires no snuffing, and the illuminating power of the candle is always as great as the composition thereof will permit.

As an improvement in that part of the operation of making candles, termed holding the wicks, prior to their immersion in the liquid grease, the patentee uses a holding rod of a different shape to those hitherto in use. The ordinary ones are common round rods, similar to the draper's yard-measure; while the improved rod is of an angular shape, and would, on

looking at the end, present nearly the form of a common triangle. On one of the three sides of this rod any requisite number of notches or indentations are made, for the purpose of catching or fixing the loops of the wicks. By the use of these sticks or rods manual labor may be dispensed with, in the particular operation hereinbefore mentioned, and a considerably increased number of candles can be made at one time.

In conclusion, the patentee states that, having described the nature of his invention of "certain improvements in the manufacture of candles and candle-wicks, and in the machinery or apparatus employed therein," he wishes it to be distinctly understood, that he does not claim the exclusive use of the solution of bismuth and oil, or any other solutions referred to, when applied to other objects or substances than that herein described; but he claims, Firstly,—the wick, prepared, made, or manufactured as hereinbefore described. Secondly, —the rod or stick, as made and used in the form and manner hereinbefore described.—[*Inrolled October*, 1852.]

To Thomas Mosdell Smith, *of Hammersmith, Gent., for improvements in the manufacture of wax candles.*—[Sealed 1st May, 1852.]

The patentee commences his specification by stating that heretofore wax candles have been made with wicks of unbleached cotton, twisted and waxed; and such wicks, when burning, often form large heads, which, if not removed by snuffing, either fall into the cups of the candles, and cause guttering, or else fall beyond the candle, and injure any cloth that may be below. He further remarks that, in candles made of spermaceti and other materials (such as stearine and stearic acid) capable of being so moulded, platted wicks have been extensively used, which have the property of turning out of the flame so as to be consumed; but it has been found that, when manufacturing wax candles by casting (running or pouring on successive coats of wax) and rolling in the ordinary way, the platted wicks cannot be used. Now the object of this invention is to manufacture such descriptions of wax candles with platted wicks.

The patentee has found that the best material for manufacturing wicks is bleached coarse cotton, or bleached cotton yarn, slightly platted; and as it is important that the size and weight of the wicks should be properly proportioned to the size of the

candle, he gives the following proportions,—at the same time remarking that he does not confine himself to the use of the wicks mentioned. Wax candles of $\frac{1}{2}$-inch diameter should have a platted wick of three strands, each strand consisting of two yarns of No. 6 cotton yarn; candles of $\frac{5}{8}$-inch diameter, a platted wick of three strands, each composed of two yarns of No. 5 cotton yarn; candles of $\frac{3}{4}$-inch diameter, a wick of three strands, each consisting of two No. 4 yarns; candles of $\frac{7}{8}$-inch diameter, a wick of three strands, each of three No. 5 yarns; candles of 1-inch diameter, a wick of three strands, each of three No. 4 yarns; and candles of 2 inches diameter, a wick of three strands, each of seven No. 4 yarns. The desired sizes of wicks for larger candles, and candles of the intermediate sizes, may be obtained by the use of No. 4 or No. 5 cotton yarn, in the manner explained; but the patentee does not confine himself thereto, as variations may be made in the size of cotton yarn and the number of yarns used.

It is found desirable to dip the wicks into a solution composed of 2 oz. of borax, 1 oz. of chlorate of potash, 1 oz. of nitrate of potash, 1 oz. of sal-ammoniac, and 3 quarts of water; but no claim is made thereto, as it is similar to what has been before used in preparing wicks. After the wicks have been saturated, the fluid is strained therefrom, and they are dried; and then the wicks are coated with wax in a cold state, by rubbing it thereon: this may be conveniently performed by using a small block or cylinder of wax with a hole through the centre, and which, being rubbed to and fro over a wick, gives a complete coating of wax to the surface thereof. The wicks so prepared are used in making candles by casting and rolling; which operations are performed for the most part in the manner commonly practised when using twisted cords of cotton; but the patentee does not find it necessary to employ tags, as heretofore. A convenient length of wick is distended on a suitable frame, so that the parts of the wick on which separate candles are to be made shall be at a small distance from but parallel to each other; and then melted wax is poured on the same, in like manner to the ordinary casting operation, until a deposit about a quarter of an inch thick has been obtained,—care being taken to use the melted wax as cool as possible, so as not to melt the coating of wax first applied to the wicks. The candles thus far made are cut apart and attached to a hoop in the usual manner, in order to undergo the remainder of the casting operation; and the casting and rolling processes are then performed in the usual way.

The frame on which the wicks are distended to receive the

first coating of wax consists of two horizontal hoops or circular frames, secured one above the other to an upright bar, formed with numerous perforations, into which pins may be inserted beneath the cross-bar of the upper hoop, so as to keep the same at any desired distance above the lower hoop. From the outer surface of the upper hoop (which is the smallest) numerous brackets project radially outwards; and the inner surface of the lower hoop is furnished with a corresponding number of brackets, projecting inwards. The wick is alternately passed under and over two brackets or projections of the two hoops or circular frames, so as to be distended in the manner before mentioned.

The patentee remarks that he has spoken of wax candles as if wax were the only material used in such candles, whereas it is well known that other matters, particularly spermaceti, are commonly combined therewith; and in making spermaceti candles in moulds, wax is commonly combined with spermaceti;—it should therefore be stated, that his invention is applicable to that manufacture of wax candles which consists of casting and rolling. He claims the manufacture of wax candles above described.—[*Inrolled November*, 1852.]

To John Cumming, *of Paisley, in the county of Renfrew, North Britain, pattern designer, for improvements in the production of surfaces for printing or ornamenting fabrics.*—[Sealed 29th April, 1852.]

This invention relates to various novel arrangements of apparatus or means to be used for the production of figured surfaces for printing, embossing, or ornamenting other surfaces,—such figured surfaces being obtained partly by the agency of the electro-metallurgic process, or electro-deposition of metals. The figured surfaces so produced are applicable for a great variety of uses, but more especially for the ornamentation or printing of woven fabrics, instead of blocks, plates, or cylinders, engraved or figured in the ordinary way.

In the first mode of carrying out this invention, the patentee takes a thin smooth copper plate, coated with silver on one surface; and on this silvery surface he deposits a thin layer of copper, by immersion in a solution of sulphate of copper, under the ordinary well known electro-deposit process. When a thin layer of copper has been obtained in this manner, the plate is removed from the copper solution, and a sheet of fine silver wire-gauze, or other permeable material of a similar

nature, is laid upon the newly-deposited copper layer. The whole is then subjected to the electro-deposit process, and a second but very slight deposit of copper is made on the back or surface of the wire-gauze; and this latter deposit is continued until the penetration of the deposited metal between the meshes of the gauze shall connect the latter firmly to the copper layer beneath it. When this is done, the first copper layer is detached from the silvered surface of the plate by heat, in the usual manner practised by electrotypists,—the plate so detached having a smooth copper surface on one side and an adhering sheet of wire-gauze on the other. The intended device or pattern is now drawn or formed on the smooth face of this plate in or by a suitable varnish, which must be a non-conductor of electricity, and may be composed of mastic, shellac, or other substance of a like nature—being, by preference, laid on the plate by a hair-pencil or pen. When the figure is so drawn or produced, the prepared plate is immersed in a vessel containing a solution of a metallic salt (such as sulphate of copper), and is then put in communication with the negative pole of a voltaic battery. This treatment has the effect of reducing, eating away, or dissolving all those parts of the plate which are not covered by the varnish or protecting coating; and the figure formed by such coating is therefore left in relief and projecting from the surface of the wire-gauze: when some solutions are employed for this purpose, the silver wire-gauze must be protected from the effect of the same. According to another mode of treatment, the plate, with its pattern drawn upon it, as described, is immersed in a solution of nitric or other acid,—the reverse side of the plate and the wire gauze being protected from the action of such solution by a varnish. In this way the uncovered surfaces of the plate are reduced or dissolved, leaving the figure in relief above the surface of the wire gauze. When this is accomplished, the plate is removed from the solution, and the varnish thereon is washed off with turpentine, or other suitable solvent, leaving the pure metallic relief-surface beneath.

To produce the actual blocks or plates for printing from the plate obtained as described, it is laid, with its figured surface downwards, upon a layer of some soft non-conducting material, which may be composed of strong boiled oil, and mastic or other varnish, mixed to the requisite consistency; and pressure is then applied to the back of the plate, so as to cause the soft material, on which the gauze surface lies, to percolate through the gauze, and fill all the spaces behind it,

between the lines of the relief figure, leaving the figured surface clear. In this condition the plate, with its gauze and layer of soft material applied as described, is removed and immersed in a solution of any suitable metallic salt (as sulphate of copper), and is connected to the positive pole of the battery. This treatment causes the deposit of the metal in solution (as copper) upon the metallic figured surface, so as to heighten the relief of the figure. The deposition is continued so long as it can be done without causing the spreading of the lines of the figure, or any injury to their sharpness and evenness; and then, if still further relief is necessary, the plate is removed from the cupreous solution, and again pressed with its gauze surface against another layer of the soft material already used. This second application forces another layer of the soft substance through the gauze, to fill the spaces to the level of the increased relief of the figure; and then the whole is again placed in the metallic solution for deposition upon the figured surface;—the metallic deposition, and the filling or forcing up beneath the gauze, being alternately carried on until the figure has attained the required relief. When the operator is satisfied of the sufficiency of this relief to enable him to print from the figured surface with clearness, the entire surface of the figured side of the plate is coated over with plumbago, or other substance which will render the same a conductor of electricity. Then, to clear off the plumbago from the surface of the relief lines, the whole surface is treated with dilute nitric acid; after which the plate is placed in the battery, and metal is deposited on its entire surface, to form a solid block or back for the figure to hold the lines in position, so as to enable the operator to attach them to a printing-block surface, or form them into a cylinder (if intended for cylinder printing); and the operation is finally completed by separating the wire gauze, with the front skeleton or outline of the pattern attached thereto, by means of heat, in the usual manner of separating electro-deposited surfaces from their matrices. The skeleton pattern or figure, so removed with the gauze, then answers for the production of future copies of the figure; while the lines deposited on the plate by the battery action, as before described, are left in a completed state, in readiness for attachment to the printing apparatus,—the layer of non-conducting material being carried off by treatment with turpentine.

In the next modification of the invention, the patentee commences by preparing a copper or other metal plate with a coating of silver or other suitable conducting metal, by any

of the usual modes of electro-deposition, plating, or silverizing. To the coated plate a partially conducting composition is then applied as a ground,—such composition being made of white-lead, or other suitable conducting powder, and tallow, wax, and turpentine, or ingredients of a similar nature. This composition is varied to suit the kind of pattern which is to be produced; and the proportions of the ingredients, and the consistency of the composition, must depend upon the openness or the intricacy and delicacy of the pattern, and the temperature of the apartment wherein the process is carried on; but the mixture which is preferred for general purposes, consists of two parts of tallow, two of white-lead, one of wax, and a little mastic. It is laid on the plate with the assistance of heat, in order that the softening or melting of the composition may allow the white-lead, or whatever other metallic matter may be used, to subside or fall through the coating, until it forms a metallic layer in contact with the silverized plate surface. This operation is most conveniently effected by placing the plate horizontally in a shallow trough or case, the edges of which fit the edges of the plate, and then pouring the composition over the surface of the plate to the necessary thickness. When this coating is hardened by the ordinary atmospheric temperature, the plate, so treated, consists, as it were, of four separate layers of material, viz., the original plate, its metallic coating, the layer of white-lead, and the external tallow or greasy composition. The external coating having been made perfectly flat and level, the intended pattern or device is drawn upon its surface, or transferred thereto from a pencil or other drawing, in the ordinary manner of transfer; and the operator then etches down through both the external coating and the layer of lead, with an etching needle or other hard instrument, having a breadth or thickness of point suited to the lines required to be produced,—the point of the instrument being, in all cases, passed clear down through the two coats to the metal surface, so as to lay the plate completely bare through the length and width of the lines of the pattern. Or, instead of this process, the transferring and etching down may be simultaneously accomplished with the aid of the pentagraph; for which purpose the pattern is first drawn upon paper or other surface, and the pentagraph being suitably adjusted, its tracer is traversed over the pattern figure, whilst the opposite arm of the pentagraph, having a proper instrument attached to it, etches or cuts out the figure to the required scale. Or, instead of this duplex process, the pentagraph may be used merely for trans-

ferring the device from the original drawing to the prepared surface of the plate with a light point or pencil, as it affords great facilities for the reduction or enlargement of the original figure. In this stage of the process, the plate presents a composition surface with the pattern in intaglio, or sunk through it, in correspondence, in every particular, with the original design, or with such portions of the design as it is intended that the plate shall print.

As the etching down cannot be conveniently or accurately performed through a thick coating, owing to the accumulation of the disintegrated portions of the composition ground, and the difficulty of preserving a clear sharp outline therein, it is usually necessary, at least in some details of the pattern, to thicken the coating after the etching has been accomplished, in order to secure a sufficient amount of relief of the printing surface. The thickening is performed by floating on or building carefully up over the blank portions an additional layer of the composition, or of tallow alone, or a mixture containing it. This is conveniently effected by using a heated flask, containing the composition in a fluid state, and fitted with a small tube, by which the fluid may be made to flow gently out upon the composition on the plate, carefully avoiding any filling up of the pattern lines. Or, instead of this plan of pouring on the melted material for thickening the coating, the latter may be gradually thickened by bringing it into contact with a roller, revolving in a trough of melted tallow, so as to cause the roller to lay on a continuous series of layers of tallow. The plate, so prepared, is now submitted to the electro-deposition process in the ordinary manner, so that copper or other metal (according to the nature of the metallic solution used) may be deposited upon the whole of the uncovered lines, that is, along all the sunk pattern lines,—the deposition being continued until the etched lines are filled to the level of the coating; and in case the etching-ground should not have been completely removed in any portions of the lines of the figure, the presence of the lower metallic layer will cause the due conduction of the electrical action, and the consequent regular deposit of metal at these parts. The distance between the external surface of the coating and the plate surface is the amount of pattern relief. The entire surface, as well of the metallic pattern figures as the coating, is now made capable of electro-conduction by a suitable metallic coating, in the usual way (the coating being removed from the metallic pattern lines by the aid of dilute nitric acid, as before explained); and the whole is again placed in the

metallic solution for the electro-deposit of metal over the entire surface, to form a solid body or plate for the pattern. The plate is completed for use by separating the figured surface from the original matrix, and then mounting it ready for printing.

Another branch of this invention relates to the formation of printing surfaces by first coating and etching down upon a plate, according to the general process first described. The prepared plate is next immersed in a solution of iron, zinc, or other metal soluble in any solution or agent which does not act upon the copper; and by the electro-deposit process the metal of the solution is precipitated, so as to fill the etched pattern lines to the requisite depth. It is then removed from this solution, and the non-conducting coat dissolved or removed from the surface in the manner already described, so as to leave the plate clean, with the relief pattern lines on its surface. After this treatment, the plate is immersed in a metallic alkaline solution, so that the iron or other metallic relief lines may not be affected; and, in this condition, it is subjected to the electro-deposit action for the deposit of whatever metallic salt is used, such as copper, over the entire surface of the plate,—covering both the relief and sunk surfaces. The original matrix-plate is then detached, by heat, from the last metallic deposit, as well as from the iron or other metallic relief lines or figures, which remain inserted in the other detached plate. This latter plate is then immersed in sulphuric acid, or other solvent of iron, for the dissolution of the iron or other metallic lines,—leaving the indented bed of such lines in the unaffected copper plate, which is thus completed in readiness for printing from when mounted.

In forming cylindrical surfaces by the direct aid of electro-deposition, the patentee prepares a copper or other metallic cylinder, by silvering and coating with the lead and tallow composition, and etching down the pattern, as already described. The prepared cylinder is then submitted to the process described under the last-mentioned modification, for the purpose of depositing iron or zinc in the lines of the figure; after which, the non-conducting coating is dissolved, and copper or other suitable metal deposited, as before explained. The cylinder is then placed in the lathe, and the outer coating of copper is turned off, bringing the surface quite true, and reducing it, by turning, until the iron, or other metallic deposit beneath, comes into view. When this is the case, the immersion of the cylinder in a solution, capable of acting on

the iron, causes the solution of the latter metal and completes the process.

He also proposes to use iron surface printing blocks, plates, or cylinders, made according to the processes or modifications thereof hereinbefore described, to obtain repeats, or fac-similies, or reverses thereof, by pressure. For this purpose, the electro-formed iron surfaces or plates are case-hardened, to enable them to resist the pressure required; and then they are impressed upon copper plates or cylinders, after the manner of milling, as practised at present from engraved rollers.

Another variety of these processes relates more especially to the production of printing or ornamenting surfaces to be used for printing a great variety of colors. This branch is carried into effect by etching down the outline of all the objects in each color of the intended pattern on a surface prepared in the manner hereinbefore described under the second general head of this invention. When this is completed, all the lining of the block, with the exception of a single color, is filled with sand, stucco, or other suitable material or composition, in a state of powder, and able to withstand the effect of great heat; then an impression of this prepared plate is taken in soft metal by coating, so as to produce a plate, having a relief surface on those parts belonging to one color only; and this plate is prepared for printing its share of the pattern by an electro-deposit of copper or other suitable hard metal on the relief surface. The same process is repeated throughout the entire routine of colors, alternately filling and casting from each color section, until as many blocks are prepared as there are colors to be printed; or, instead of this process, a similar result may be obtained by an electro-deposit of metal for each block, by any of the processes hereinbefore described.

The patentee remarks, that although he has described his various processes, as more especially suited for printing purposes, the same may be economically adopted in the preparation of embossing surfaces and figures for various other ornamental purposes.

The patentee claims, First,—the systems or modes of forming or producing figured surfaces, as hereinbefore described. Second,—the application and use of wire gauze, or other similar permeable material, for the production of figured surfaces, as hereinbefore described. Third,—the application and use of figured surfaces, formed in combination with, or supported upon, wire gauze or other suitable permeable ma-

terial. Fourth,—the system or mode of increasing the amount of relief of the figure, by forcing non-conducting matter through a permeable back to the face of the figure. Fifth,—the system or mode of thickening, building up, or deepening the etching or figuring ground, by additions to the figured ground, as hereinbefore described. Sixth,—the application and use of a metallic layer in the etching or figuring ground, as hereinbefore described. Seventh,—the system or mode of conducting the electro-deposit to the bottom of the figured lines in the etched or figured ground, by means of a metallic layer or metallic particles in the ground, as hereinbefore described. Eighth,—the adaptation and use of the pentagraph for drawing on or figuring the ground, as hereinbefore described. Ninth,—the system or mode of producing figured surfaces of compound metals, or of two or more metals in combination, as hereinbefore described. Tenth,—the system or mode of producing figured surfaces by means of case-hardened electro-formed iron matrices. Eleventh,—the systems or modes of producing figured surfaces for printing more than one color, by alternately filling up the lining of all the colors, except one, and casting or electro-depositing the figure in the latter lines, as hereinbefore described. Twelfth,—the employment and use of a coating or layer of silver, or other suitable conducting film, to facilitate the separation of the deposited plate from the matrix or foundation, as hereinbefore described. Thirteenth,—the application of an electro-deposited back to the pattern lines, as hereinbefore described.—[*Inrolled October*, 1852.]

To LAZARE FRANÇOIS VAUDELIN, *of Upper Charlotte-street, Fitzroy-square, for improvements in obtaining wool, silk, and cotton from old fabrics, in a condition to be again used,—being partly a communication.*—[Sealed 30th June, 1852.]

THE object of this invention is to obtain wool, silk, and cotton from old fabrics, in such a condition as to admit of the same being again spun and used in the manufacture of other fabrics; and it is proposed to effect this by passing the old fabrics, whilst immersed in water, between a rotating cylinder and a flat plate, or other surface, armed with teeth or points, by which the fabric is torn to pieces, and the fibres brought into a suitable state to be again manufactured into fabrics. It has hitherto been the practice to tear old fabrics to pieces, for

the above purpose, in a dry state; but the fibres are not so readily separated, and are more injured and broken than when working according to this invention, with the fabrics constantly immersed in water,—whereby, also, the fibres are thoroughly cleansed.

The old fabrics having been washed, if they require it, are cut into pieces, say from two to eight inches square, and then introduced into a machine similar to those employed in the preparation of rags for making paper, except that the patentee prefers to construct it with two beating-wheels. This machine is shewn in Plate V., at figs. 1, and 2,—fig. 1, being a plan view and fig. 2, a vertical section thereof. *a, a,* are the beaters or beating-wheels, in the periphery of which numerous straight metal blades *b,* with plain edges, are fixed, at equal distances apart, and parallel to the axis of the beater. In some cases, however, as when tearing silk, cotton, and mixed rags, the patentee uses blades with notched edges; and then he places behind each beating-wheel a comb or bar, with points to hook off the silk or cotton, so as to prevent any clogging of the machine. The beating-wheels are furnished with covers (not shewn), to prevent the splashing over of the water; and guards *c,* are provided, to prevent the fibrous materials passing between the flanges of the beating-wheels and the sides of the machine. Beneath each wheel there is fixed a metal plate *d,* covered with points or teeth, which serve, with the blades *b,* of the rotating-beaters, to tear and separate the fibres of the rags that are drawn between them by the rotation of the beaters. Water constantly flows into the cistern of the machine through the pipe *e,* and continually passes off through the perforated surfaces *f,* and pipe *g.* When silk goods are being operated upon, the work goes on better if the water is used at a temperature of about 90° Fahr., and a small quantity of soft soap may be introduced into the water with advantage. The axes of the beating-wheels can be raised and lowered by means of screws (not shewn), as may be required during the operation of separating the fibres.

The patentee states, that he does not confine himself to the above details, as the same may be varied, so long as the peculiar character of his invention—that of treating old fabrics in water, so as to separate the fibres into a state to be again used with other fibres in the manufacture of fabrics, by spinning and weaving—be retained.—[*Inrolled December,* 1852.]

To William Eccles, *of Walton-le-Dale, in the county of Lancaster, cotton spinner, for certain improvements in looms for weaving.*—[Sealed 19th September, 1850.]

This invention consists, firstly, in a method of determining a backward movement of the cloth and warp-beams, when the shuttle shall have failed in duly carrying the weft-thread between the shed of the warp: which backward motion is usually called a "recoil." This the patentee effects by the application of a stop or stops, so mounted as to be capable of revolving with the cloth-beam during its regular motion, but which, not being free to revolve in the other direction, serve as abutments for determining the amount of recoil, when the cloth-beam shall have been rendered free to perform its retrograde action;—such stop or stops, and that part of the loom which then arrives in contact therewith, or one of them, being capable of adjustment, so as to vary their usual relative positions, and thus provide for any required amount of recoil.

Secondly, the invention relates to the means of raising the "taking-up-catch" of a loom from its ratchet-wheel, and consists in the employment of a spring, or other elastic substance, for such purpose,—the object being, to render the catch capable of rising from the tooth without that straining effect which is consequent upon the usual construction of such parts.

Thirdly, the invention consists in a method of breaking the impetus of the working parts of a loom, when the driving-strap is thrown off. This is accomplished by the application of a spiral spring, one end whereof is attached to some stationary part of the loom, and the other to the "frog-piece," or other part which is brought into action by the effect of the "stop-motion."

In Plate VI., fig. 1, is an end view of a loom, with the first improvement applied thereto; and fig. 2, is a detached view of part of the same. The taking-up motion is shewn as proceeding from the vibrations of the sword of the loom,—there being a projecting part *a*, affixed thereto, the outward end of which is provided with a pin, that works in a slot, formed within a lever *b*. This lever turns upon a fixed centre-pin *c*, and its upper part is connected to one end of the driving-click *d*, which, being placed within the teeth of a ratchet-wheel *e*, causes it to move in the direction of the arrow at each pick of the loom. Upon the axle of the ratchet-wheel *e*, there is a pinion *f*, taking into a toothed wheel *g*, which is mounted upon a stud *h*, projecting from the framework of the machine; and upon this stud is another pinion *i*, which, by

the means shewn, communicates the necessary motion to the cloth-beam *j*. Mounted loosely upon the stud *h*, is a ratchet-wheel *k*, within the teeth of which is placed a retaining-click *l*,—the other end thereof being capable of turning upon a fixed centre-pin *m*. One of the arms of the ratchet-wheel *k*, is formed with a slot *n*, and through this a pin passes, so as to bolt a projecting-piece *o*, firmly to the arm of the ratchet-wheel; nevertheless, such projecting-piece may, by loosening the bolt, be moved to any desired part of the said arm. The piece *o*, extends inwards far enough to protrude beyond the line in which the arms of the wheel *g*, revolve; and therefore when the wheel *g*, is caused to rotate by the before-mentioned means, one or other of its arms will, on arriving in contact with the piece *o*, carry it forward, and thus effect the revolution of the ratchet-wheel *k*. The ordinary spring-lever is shewn at *p*, and is connected by any of the usual methods, so as to move from its notch when the weft-thread is unduly absent, or the shuttle misses boxing,—such motion (when a recoil is effected by mechanical agency) causing the driving and detaining-clicks *d*, *q*, to rise from the ratchet-wheel *e*, so as to allow the cloth and yarn-beams to recoil. The clicks *d*, *q*, are mounted upon an axle *r*, (see fig. 2,) to which is also attached an arm *s*, extending under a pin that projects from the driving-click *d*. The axle *r*, being caused to turn upon its centre by the motion of the spring-lever *p*, will therefore lift the two clicks *d*, *q*, from the teeth of their ratchet-wheel, so as to allow the ordinary apparatus, by which the yarn-beam is weighted, to draw back the woven cloth.

The operation of this part of the invention is as follows:—Upon the weft-thread failing, or the shuttle having become "trapped," the ratchet-wheel *e*, will be liberated, the recoil then taking place, and the spur-wheel *g*, will also be caused to turn in a backward direction,—the ratchet-wheel *k*, however, being kept stationary by the detaining-click *l*. This retrograde motion of the wheel *g*, will continue until that one of its arms, which is in advance of the stop-piece *o*, shall have arrived in contact therewith; and then the recoil will be arrested, as the ratchet-wheel *k*, cannot move onward therewith. The stop-piece *o*, therefore becomes the means of determining the extent to which the cloth and yarn-beams shall act with a reversed motion; and, by shifting the position of its confining bolt within the slot *n*, a variation may be effected, so as to suit the amount of recoil to the description of goods in progress of being manufactured; for it is evident that, as the stop is placed in an angular opening of

the wheel *g*, a situation nearer to the centre of motion, will decrease the space through which the arm can travel, before it comes in contact with the stop; and a similar adjustment to a point further from such centre will increase the capability of recoil. In order to steady the action of the ratchet-wheel *k*, a spring *t*, or other yielding substance, is affixed to the framework of the loom, and allowed to press against the face of the wheel, so as to act with a slightly retarding power.

Fig. 3, shews a modification of this part of the invention. The stop-piece *o*, is mounted so as to be adjustable upon an arm of a drum or pulley *u*, around part of the circumference of which is placed a friction-brake *v*. This brake *v*, is capable of turning upon a fixed centre at *w*, and at another part is connected, by any suitable arrangement, to the ordinary spring-lever; so that, upon such lever being thrown from its notch, the brake will press against the periphery of the drum or pulley, and thus prevent it from being carried back when the arm of the wheel *g*, shall have arrived in contact with the stop *o*. In this modification, therefore, the drum or pulley occupies the place of the ratchet-wheel *k*; and the friction-brake *v*, that of the detaining-click *l*.

Fig. 4, represents another modification for regulating the amount of recoil. In this instance, one of the arms of the ratchet-wheel *k*, or drum or pulley *u*, is provided with a slot, extending on each side therefrom; and in this are placed two adjustable studs *o*, *o*, projecting, as before, so as to intercept the arms of the spur-wheel *g*. It will be evident, that on decreasing the distance between these two studs, a greater amount of recoil will take place; and that on increasing such relative position, a less amount of recoil will be permitted.

In the foregoing description, the projecting-piece or pieces, which are mounted upon the ratchet-wheel or drum, have been described as adjustable; but precisely the same effect may be produced by keeping them in a fixed position, and gaining the required variation by providing for an alteration in position of the arm of the wheel *g*; or the said arm may be cast with the wheel as usual, and an additional part connected thereto, so as to be capable of being moved nearer to, or further from, the stop-piece or pieces *o*.

The second improvement is exhibited at fig. 5. *a*, is the ratchet-wheel, through which the woven cloth is taken up; *b*, is the driving-click; and *c*, is the detaining-click; to the upper part whereof is affixed a projecting-spring *d*, the outward end of which passes into a link that rises from the

driving-click *b*. Upon the click *c*, being raised from its ratchet-wheel, the driving-click *b*, will also be removed therefrom, through the intervention of the spring *d*, should there be no impediment thereto. If, however, the front of a tooth should so much overhang as to cause a binding action, then the spring *d*, will be kept downwards, and allow an independent motion of the detaining-click *c*, until the reaction of the parts, consequent upon the stopping of the loom, has destroyed the binding action; at which time, the elasticity of the now bent spring *d*, will lift the driving-click, so as to admit of the recoil.

The third improvement is shewn at fig. 6, which represents a partial side elevation of a loom. One end of a spiral spring *a*, is attached to the framing of the loom, and the other to the moveable "frog-piece" *b*; when, therefore, the arm *c*, of the "protector-rod" arrives in contact with the "frog," the spring *a*, will be caused to expand, and, by its elasticity, considerably reduce the concussion.

The patentee claims, Firstly,—the application of parts, adjustable with respect to each other, and revolving uniformly (in such adjusted relative positions) during the ordinary operation of the loom; the one, however, becoming an abutment for the other, so as to effect a stoppage of the retrograde movement of the cloth-beam, and thus effect a positive quantity of recoil, capable of being varied in amount as desired. Secondly,—the use of an elastic medium for the purpose of disengaging the driving-click from its wheel. Thirdly,—the application of a spiral spring to the purpose of breaking the impetus of the different parts of the loom when suddenly stopped.—[*Inrolled March,* 1851.]

To Alfred Vincent Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in machinery for propelling vessels, and in apparatus to be used in connection therewith,—being a communication.*—[Sealed 1st June, 1852.]

The first part of this invention relates to the arrangement of engines on board of ships or other vessels, and the transmission of motion from them to the paddle-wheel shaft. It consists in arranging all the engines in a line parallel with and just over the central keelson, running fore and aft;—the engines consisting each of one or two pairs of cylinders, the two cylinders of each pair being placed one above the other, with their inner

or opposite ends open, and the said cylinders being provided with pistons which are connected together, when this is combined with a central beam, that extends between the two pistons, and is connected by a joint-link or links with the piston or pistons, and also with the crank-shaft,—whether such engines be impelled by the expanding force of atmospheric air or other permanent gas, or by steam.

The second part of the invention relates to the method of arranging two engines or pairs of engines, and their working beams and connecting rods, so that the connection of the two, by means of rods, with the crank or cranks of the paddle-wheel shaft, shall be at right angles or nearly so,—that when one is passing the dead point, the other shall be acting at right angles. And this part of the invention consists in forming the working beams, which are placed between the open ends of the cylinders in engines thus arranged, each with an arm, which in the vibrations extends into the lower cylinder, so as to admit of arranging the engines in a compact form, and locating them with reference to the stability of the vessel and the proper elevation of the paddle-wheel shaft, and at the same time connecting the two beams, by means of connecting-rods, with the crank or cranks of the paddle-wheel shaft, at right angles or nearly so.

The third part of the invention relates to the employment of caloric engines on board of ships or other vessels, and consists in arranging such engines within a closed space or chamber in such vessel, to protect them from the injurious effects of water; when this is combined with the mode of supplying air to the engine-room through trunks, which extend from the top to near the bottom of the engine-room, and with a discharge-pipe, connected with the exhaust of the engine or engines, for the discharge of the air or other gas; whereby a proper temperature and an efficient ventilation is secured in the engine-room, notwithstanding the heat radiated from the cylinder, &c., and the enclosed condition of the room, for the protection of the machinery.

In Plate V., fig. 1, is a plan view of a ship, fitted with engines according to this invention; and fig. 2, is a central longitudinal vertical section of part thereof, on an enlarged scale. It will be seen that the engines are arranged in a line fore and aft, and located in a space cut through the several decks 1, 2, 3, and extending upwards from the keelson 4. This space, which is in the middle of the ship's breadth, is formed by two side bulk-heads *a, a*, properly trussed, to give greater strength and stability to that part of the ship which is most

exposed to be strained by the weight and thrusts of the engines. These bulk-heads extend above the top of the engines; and the space between them is decked over, as at *b*, to protect the engines from rain and spray. In fig. 1, the positions of the engines and shaft are represented by dotted lines below this deck or roof. At each end of the engine-room there is a vertical trunk *c*, extending down to within a short distance of the keelson, for the admission of air; and near the middle of the engine-room, at one side, there is a vertical discharge-pipe *d*, also extending to within a short distance of the keelson, for the discharge of air, in manner to be presently described.

There are two double engines A, A, one in front and the other behind the paddle-wheel-shaft B, and at equal distances therefrom. Each double engine is composed of two working-cylinders *e*, *e*, and two supply-cylinders *f*, *f*; and the upper ends of the former, and the lower ends of the latter, are open and directly opposite each other. To these cylinders are fitted working pistons *g*, *g*, and two supply-pistons *h*, *h*, connected together in pairs by rods *i*, *i*; that is, one supply and one working piston, so that they move together,—their cylinders being in the same line. The supply-pistons are provided each with one or more valves *j*, opening inwards; and the heads of the supply-cylinders are also provided with one or more valves *k*, opening outwards into a receiver *l*, connected with both supply-cylinders. As one supply-piston descends with its working-piston, the valve *k*, closes, and the valve *j*, opens, to admit air into and fill the supply-cylinder *f*, at the pressure of the atmosphere; and as the pistons rise, the valve *j*, is closed, and the valve *k*, is opened, to force the air from the supply-cylinder into the receiver *l*; from which it passes through a pipe *m*, down to two valve-chests *n*, *n*,—the pipe *m*, being branched for that purpose, as represented by dotted lines. There is one such valve-chest for each working-cylinder, communicating therewith by a port *o*; and each chest is provided with the requisite induction and eduction ports and valves; but as these ports and valves, and the method of working them, are similar to those employed in single-acting steam-engines, it is deemed unnecessary to describe and represent them. When the induction-valve is opened, the air enters the working-cylinder, and acts against the under face of the working-piston. The air is heated within the working-cylinders by suitable furnaces, placed below each working-cylinder; but these it is not necessary to describe or represent. While the working-piston is being forced up, the supply-piston is forcing the air, previously received, through the receiver *l*,

and pipe *m*, and valve-chest *n*, to supply the working-cylinder; and as the air is heated, and its volume increased, it forces up the working-piston, by reason of its surface being greater than that of the supply-piston. A little before the working-piston reaches the end of its upward stroke, the induction-valve is closed, and the eduction-valve opened, for the escape of the air, which passes out through a pipe *p*, that communicates with the vertical discharge-pipe *d*, before described. Each engine being double, as one working-piston, with its supply-piston, is being forced up by the pressure of the heated air, the other is descending and discharging, thus constituting a double-acting engine. The alternate action of the pistons is secured by having them connected by means of a beam C, whose axis of vibration is midway between the two sets of cylinders. The ends of this beam pass in between the open ends of the cylinders and the rods *i*, *i*, that connect the pistons, and are connected with the under face of the supply-pistons by means of joint-links D, D; so that as one set of pistons ascend, the other must descend, and *vice versâ*. That end of the beam of each engine which is nearest the paddle-wheel shaft is formed with a triangular arm E, extending down into the working-cylinder nearest the shaft; and its extremity, which reaches nearly to the working-piston, is connected by a rod F, with the crank G, of the paddle-wheel shaft.

The other double engine, on the other side of the paddle-wheel shaft, is, in every particular, like the one above described; and its beam is, in like manner, connected with the same crank of the paddle-wheel shaft, but at right angles, or nearly so, with the first,—so that the two engines work in succession on the same crank.

From the foregoing it will be understood, that the supply of air for the engines can only be received from the lower end of the trunks *c*, *c*; which extend from the roof of the engine-room to within a short distance of the bottom thereof; and that as the air, after acting on the pistons, is discharged through the pipe *d*, above and outside of the engine-room, the working of the engines must, of necessity, keep up a constant and efficient ventilation or circulation throughout the engine-room. This ventilation or circulation will ensure a cool atmosphere in the lower part of the engine-room; because the supply of air through the trunks is delivered near the bottom, and is drawn into the engines near the top; and hence the air in the room, as it is heated by the radiation from the furnaces and working-cylinders, will gradually ascend

to supply the engines, whilst the cool air will be supplied at bottom, by the trunks. The perfect ventilation or circulation, thus produced, will admit of having the engine-room entirely closed in at top (except skylights), to exclude rain and spray, which would be quite destructive to the open cylinders and the piston packings. The furnaces should be supplied with air from pipes connected with the exhaust-pipes *p*, *p*, or in any other way which will not interfere with the system of ventilation or circulation herein described.

The arrangement of the engines in a line fore and aft, along the middle of the vessel, spreads the weight over a great portion of the length, and occupies but little space in the breadth of the vessel, which will admit of using cylinders of very great diameter, and still leave the decks, along the sides, unbroken in the length,—affording room on each side of the engines for state-rooms or storage. This arrangement also admits of the adoption of a very efficient system of diagonal bracing, to stiffen the vessel and resist the thrusts of the engine. If desired, the upper ends of the trunks, for the supply of air, may be covered with caps, which will leave free passages for air, and prevent water from entering.

The inventor wishes it to be understood that he also contemplates the application of the herein-described mode of communicating motion to the paddle-wheel shafts to ships propelled by steam-engines, by using the steam directly in what have been termed the supply cylinders, and expanding it in the larger or working cylinders, or by applying the steam in any other manner, so long as the inner ends of the cylinders are open, and the pistons are connected with each other and with the beams between them, and the connection with the paddle-wheel shaft is formed in the manner before described.

The patentee claims the arrangement of the engines in a ship or vessel in a line fore and aft, with the open ends of the upper and lower cylinders towards each other, substantially as specified, in combination with the working beam between the open ends of the cylinders, to form the connection with the crank-shaft, substantially as specified, whether the said engines be operated by the expansion of atmospheric air or other gas or steam. Also forming the working beams, which are located between the open ends of the cylinders (when combined with engines arranged in a line) each with an arm extending into the open end of one of the cylinders, so that the connecting rods from the two beams shall take hold of and act upon the crank or cranks at right angles, or nearly so, under a proper location of the paddle-wheel shaft, with reference to efficiency

of propulsion, and the engines with reference to stability and compactness, whether the said engines be actuated by atmospheric air or other permanent gas, or by steam. And also in combination with caloric engines, arranged in manner substantially as specified, within a closed room, or space in the middle of a ship, and closed in at top,—the arrangement of the trunks, for admitting air requisite to feed the supply-cylinders, from the top to the bottom; and the pipe for the discharge of the air from the engines, substantially as specified; by means of which the inventor is enabled to enclose the engines, for protection from rain and spray, and, at the same time, obtain an efficient ventilation or circulation within the engine-room, as specified.—[*Inrolled December,* 1852.]

To Owen Williams, *of Stratford, in the county of Essex, engineer, for improvements in preparing compositions to be used in railway and other structures, in substitution of iron, wood, and stone,—being a communication.*—[Sealed 31st January, 1852.]

This invention consists in the preparation of compositions to be used in the construction of railways, drains, sewers, cisterns, pavements, buildings, bridges, viaducts, and other structures.

To prepare a composition for the permanent way of railways, blocks for building purposes, drains, sewers, cisterns, and other structures, the patentee takes about 180 lbs. of pitch, 4½ gallons of dead oil or creosote, 15 lbs. of raw brimstone, 18 lbs. of rosin, 45 lbs. of finely-powdered lime, 108 lbs. of finely-powdered gypsum, and 27 cubic feet of sand, gravel, breeze, scoria, pieces of stone, brick, or other hard material, previously passed through a half-inch sieve. The sulphur is first melted in a boiler with about 30 lbs. of the pitch; the rosin is next introduced and the mixture caused to boil; then the remainder of the pitch is added and the mixture boiled up; after which the lime and gypsum are gradually introduced and the mixture made to boil; then the operator puts in the sand, gravel, breeze, scoria, pieces of stone, brick, or other hard material, which must be perfectly dry and have been previously heated; and lastly, the dead oil is added. The whole is constantly stirred and worked together till it is sufficiently heated; it is then thrown into moulds and well pressed in until the mould is properly filled; and when cold it is ready for use.

The composition for pavements, floors, and like structures, is composed of 10 lbs. of pitch, 1 quart of dead oil, 2 oz. of rosin,

5 lbs. of gypsum, 5 lbs. of lime, 4 lbs. of sulphur, ½ cubic foot of sharp sand, and ½ cubic foot of gravel, about the size of peas. These ingredients are treated in the same manner as those which form the preceding mixture.

A composition, to be used for joining pieces together, or as a mortar for cementing the blocks in building, consists of 20 lbs. of tar, 2 quarts of dead oil, 1 lb. of tallow, 2 lbs. of sulphur, 20 lbs. of lime, and 4 lbs. of rosin, boiled and applied hot.

A composition for covering roofs, bridges, viaducts, and other structures, is composed of 40 lbs. of tar, 4 quarts of dead oil, 4 lbs. of sulphur, 2 lbs. of rosin, 6 lbs. of tallow, and 10 lbs. of lime, boiled and treated in the same manner as the first mixture.

The patentee prepares the composition for use, in the construction of the permanent way of railways, by moulding it in pieces or blocks of convenient size for handling, say about 3 ft. × 18 in. × 4 in., and lays the same side by side, longitudinally, as indicated in Plate VI., by fig. 1, which is a transverse section of the permanent way for a double line of railway. The successive blocks *a*, are cemented together at the ends to render them continuous, and are connected in pairs, by transverse pieces *b*, of the composition, which are cemented in holes formed in the sides of the blocks *a*, at *c*, to receive them. The transverse pieces *b*, are also formed with holes through them, as represented in the enlarged transverse section fig. 2, for the purpose of receiving the holding down bolts *d*. The holes in the blocks *a*, and transverse pieces *b*, are made, when moulding such blocks and pieces, by introducing iron rods or cores into the moulds, and pressing in the composition around such rods or cores, which are afterwards drawn out, leaving the holes clear. The ballast is pressed into the spaces between the longitudinal slabs and transverse pieces; and planks of wood *e*, are laid upon the ballast, and fastened down to the transverse pieces *b*, by bolts and nuts *d*, or other fastenings that will admit of being slackened, so that the rails (which are fastened to the planks in any convenient way) may be raised or lowered by adding to or taking from the ballast beneath the planks. The surface of the permanent way between the longitudinal blocks is covered with slabs *f*, of the same composition, about two inches thick, and of any convenient length and width, so as to prevent the water from penetrating from the surface to the ballasting. Drains *g*, are introduced for carrying away the surface water into the side drains *h*. The drains are made of blocks of suitable width and thickness, and the ramparting *i*,

of blocks about three inches thick. Fig. 3, is a transverse section of a longitudinal sleeper, cast or moulded with a recess or channel in it, to receive the ballast on which the plank is laid. The patentee remarks that he considers it necessary to prevent the ballast from shifting by enclosing it as shewn, and also as dry as possible, to prevent the moving or knocking about of the permanent way, and thus ensure its durability.

In conclusion, the patentee states that he does not confine himself to the precise quantities of the materials above given, and that some of them may be omitted or others added. The peculiarity of the invention consists in the mode of employing such materials, and particularly the use of sulphur combined with the matters above described, when making compositions for the purposes herein described.—*Inrolled July*, 1852.]

To COLIN MATHER, *of Salford, in the county of Lancaster, machine-maker, and* ERNEST ROLFFS, *of Cologne, in the Kingdom of Prussia, Gent., for certain improvements in printing, damping, stiffening, opening, and spreading woven fabrics.*—[Sealed 11th March, 1852.]

THE improvements in printing consist in certain constructions and arrangements of parts for printing woven fabrics on that principle known as "surface printing;"—the points of novelty being, firstly, the employment of a color-roller or rollers, in immediate connection with the printing surface or surfaces,—that is, without the intervention of "furnishing" rollers, such as are ordinarily used in surface printing; secondly, the employment of a stationary table or tables, against which the printing surface or surfaces exert their pressure; and, thirdly, in the use of peculiarly-constructed rollers, for receiving the projections intended to constitute the device to be printed.

The improvements in damping and stiffening consist in the employment of a cylinder, placed within a vessel containing water or stiffening matter, and revolving in contact with the goods to be operated upon, so as to apply to them the water or stiffening materials.

The improvements in opening and spreading consist in an apparatus for uncoiling woven fabrics which have passed in the rope form from the bleaching or other process,—the peculiar feature of this part of the invention being, the use of revolving discs, which may be caused to move in contact with either side of the rope of goods, and thus, by turning it upon its axis, effect an unwinding of the coiled or twisted portions.

In Plate VI., fig. 1, is an end view and fig. 2, a cross section of a machine constructed according to the first part of this invention, and arranged so as to print from three surface-rollers. Figs. 3, 4, 5, 6, 7, 8, 9, are detached views of parts of the same. *a*, is the framework of the machine; and *b*, is a rod, the ends whereof are secured to the end frames *a*. This rod has collars *c*, (fig. 8,) attached to it, and is made hollow, for a portion of its length, as indicated by the dotted lines *d*, in fig. 3, (which is a detached view of the rod and part of the framework); and a slot *e*, is also formed in the rod, communicating with the hollow portion thereof. The collars *c*, are made with V-grooves *f*, of which there are (in this instance) three in the circumference of each collar; and within each pair of these grooves there is placed a bar *g*, widened at its outward part (shewn separately at figs. 4, 5, 6, 7): these parts constitute tables, against which the fabric is to be printed. Upon the rod *b*, are mounted sliding-pieces *h*, *h**, (see figs. 8, and 9,) one of which is provided with a pin, that projects through the slot *e*, and is attached to a bolt, situate within the hollow part *d*, of the rod *b*. This bolt is furnished with a screw at its outward end, to receive a nut, by turning which the bolt is caused to move in its recess, and, by means of the connecting-pin, draw with it the sliding-piece *h*; and a similar motion is, at the same time, imparted to the other sliding-piece *h**, through the intervention of a connecting-rod *i*. The sliding-pieces *h*, *h**, are provided with projecting parts, within which the tables *g*, are situate; and they are furnished with pins *j*, which take into inclined grooves *k*, upon the ends of the tables *g*, so that the sliding of the pieces *h*, will move the tables outwards or inwards in a radial direction, and so bring them nearer to or further from the printing-rollers.

By reference to fig. 2, the position of the parts described will be observed. *l*, *l*, are the printing-rollers, which turn in suitable bearings, capable of sliding upon the framework of the machine. The furnishing-rollers *m*, *m*, are mounted in ordinary color-boxes *n*, *n*; but, instead of revolving in contact with intermediate rollers, blanket, or cloth, their peripheries bear directly against the printing surface, to which the color is thus conveyed. The fabric to be printed and the accompanying back-cloth or blanket pass, as usual, over guides, and thence over a roller *p*, of equal circumference to the printing-rollers; and they are then taken by the first of a series of rollers *o*, *o*, each of which is provided with several rows of projecting points, as shewn in the detached views, figs. 10,

and 11. These rollers being caused to revolve, conduct the fabric through the machine, and, by means of their points, prevent it from contracting or becoming loose, and thereby distorting the pattern required to be printed. The axles of the furnishing-rollers *m*, are mounted in bearings *q*, capable of sliding upon the framework; and to these bearings are connected links *r*, which, being in combination with the system of levers *s*, *t*, *u*, afford the means of causing the furnishing-rollers to be pressed towards the printing-rollers by the application of weights to the parts *v*; which weights also carry forward the sliding brasses of the printing-rollers through the intervention of screws *w*, so as to cause them to press upon the printing-tables. In order, however, to regulate such pressure, bell-crank-levers 2, 2, are provided, which press at one end against the axles of the printing-rollers, and form stops thereto, capable of adjustment by the screws 3, 3; and, for the purpose of regulating the pressure of the furnishing-rollers upon the printing-rollers, the screws *w*, take into the bearings *q*; while the other ends thereof abut against the fixed brasses of the printing-rollers; so that, by turning the screws *w*, (by means of the milled nuts upon them), the furnishing-rollers may be forced backwards against the action of the weights, or allowed to advance, so as to press more or less upon the printing-rollers. The horizontal positions of the furnishing and printing-rollers are regulated by set-screws *y*, *y*, which elevate or depress their bearings. The doctors 1, are provided with set-screws, in order to regulate the thickness of color carried on the furnishing-rollers to the printing-rollers.

The next part of the invention, viz., a method of constructing surface-rollers for printing, is applicable to printing-machines of other construction than that already described, and is therefore referred to separately. Fig. 12, represents this portion of the improvements. Upon an axle *a*, a number of annular pieces or washers *b*, of paper, pasteboard, felt, or other suitable material, are placed; and they are compressed firmly together, so as to form a solid mass, by means of a nut *c*,—the other end of the axle being provided with a fixed collar *d*, Into the roller, so formed, projecting-pieces are driven, or otherwise attached thereto, according to the design required; and the roller may then be printed from in the usual manner.

The next part of the invention is shewn at fig. 13, which represents a section of the apparatus for damping or stiffening woven fabrics. *a*, is a vessel, of any suitable material, containing water, or gum solution, or other stiffening matter, as may be required; and partly within this vessel is placed a

cylinder *b*, of brass, or other suitable substance, so that, when caused to revolve, its periphery shall pass through and take up a portion of the liquid contained in the vessel *a*. At each side of the apparatus there is a frame *c*, capable of adjustment by tightening screws; and within these frames there are sliding-pieces, which carry a scraper or doctor *d*, capable of being caused to press against the periphery of the cylinder *b*, with varying degrees of force, by means of set-screws. The goods to be damped or stiffened pass over guide-rollers *e*, and thence over the periphery of the cylinder *b*, where they absorb the water or stiffening material, and are then wound upon the roller *f*, which is caused to revolve by contact with the periphery of the cylinder *b*. It will be evident that, by adjusting the pressure of the scraper or doctor *d*, the amount of moisture or stiffening matter to be conveyed to the fabric may be considerably varied. The cylinder *b*, may be plain upon its periphery; or, if desired, may be fluted, or otherwise indented, so as to be capable of conveying a greater amount of moisture or stiffening material.

The last improvement is shewn at figs. 14, and 15,—fig. 14, being an elevation, partly in section, and fig. 15, a plan view, also partly in section. *a*, is a stud, attached to a beam or other part of the building; and upon this stud is affixed a bearing *b*, within which is situate one end of a shaft *c*,—the other end thereof being carried by any convenient arrangement. The shaft *c*, is driven by a pulley *d*, and is provided with a pinion *e*, taking into the teeth of another *j*, which turns loosely upon the stud *a*. Upon the stud *a*, is also mounted, loosely, a collar *f*, formed with a projecting part *g*, whereon is mounted, loosely, a collar *h*, having a pinion *i*, affixed thereto, which takes into that represented at *j*. To the collar *h*, are attached, by means of flanges, two curved discs *k*, which are thus caused to revolve, but are, at the same time, capable of being turned around the stud *a*, by means of a lever *l*, affixed to the collar *f*. The goods from the bleaching, dyeing, or other process, where they have been treated in the "rope," are conducted through a stationary eye, and thence between the revolving discs *k*. The attendant stands with a rod in his hand, which is attached to the lever *l*, and watches the rope of fabric as it proceeds towards the machine used for winding the goods into a batch or roll. When there is no twist in the cloth, it passes freely between the discs, they running the same way, and so arranged as to allow a free passage for knots, or any varying thickness of the cloth; but, when the attendant perceives a twisted portion

passing between or beyond the pair of discs, he turns the collar *f*, upon its centre, so as to cause the pinion *i*, to roll upon that shewn at *j*, and thereby brings the forward part of one or other of the discs into contact with the advancing rope, which, by the revolution of the said disc, will be caused to turn upon its axis, and thus effect an uncoiling of the twisted portion. Thus, in fig. 15, the attendant has so shifted the position of the discs, that the point A, is caused to travel in the direction of the arrow against the fabric; the coil, therefore, existing at B, will, upon its arrival at the point A, become untwisted, and the goods proceed to the winding-machine in an opened state; and, if a coil next appear in the opposite direction, it will, in like manner, be removed by shifting the lever *l*, so as to bring the point C, to revolve in contact with it.

The patentees claim, Firstly, as applied to surface-printing machines,—the employment of a roller or rollers, which convey color to the printing-cylinder or cylinders direct;—that is to say, without the use of intermediate furnishing-rollers or blanket. Secondly,—the employment of a stationary table or tables, against which the printing surfaces are caused to act. Thirdly,—constructing cylinders for receiving devices for surface printing, by placing washers of paper, or other suitable material, upon a shaft or mandril. Fourthly,—the use of a cylinder, in combination with a doctor, or equivalent thereto, for conveying moisture or stiffening matter to woven fabrics by contact. Fifthly,—the use of revolving discs, for opening or spreading woven fabrics.—[*Inrolled September*, 1852.]

To THOMAS BLAKEY *and* JOSEPH SKAIFE, *of Keighley, in the county of York, millers, for improvements in mills for grinding.*—[Sealed 6th July, 1852.]

THIS invention relates to an improved method of dressing millstones.

The working grooves or lines on the face of millstones are usually arranged in sets of straight lines, placed at particular angles. It has been found, by experience, that this arrangement is open to objection, inasmuch as the meal is not delivered quick enough, and air cannot easily reach the grinding surfaces: consequently, the meal gets heated, and is thereby injured. To obviate these difficulties, curved lines have been substituted for straight lines, but without success, as the stones did not deliver freely, and the air was prevented by the meal from entering the working lines or grooves.

The present invention consists simply in substituting compound curved lines in place of either straight lines or simple curves: that is to say, the lines are curved in two directions, as shewn at fig. 1, Plate VI. The first curve starts from the eye of the stone, and is taken at a given angle, according to the speed at which the stone is intended to be driven. By thus setting the curve at an angle, the corn, when it first enters, is quickly broken down, and is caused to travel quickly over that portion of the stone nearest the centre or eye, until it arrives at the best and most effective part of the grinding surface, where the operation of grinding is performed with much greater ease, and in a more effectual manner, than heretofore; the line or groove is then made to bend or curve round in the opposite direction, and thereby a quick delivery of the ground corn or meal, and an indraft of air through the eye to the grinding surfaces, are simultaneously effected.

It will be understood, that the inner curves draw in the corn and convey it quickly to the most effective part of the grinding surface, where it becomes ground before it has time to heat, and that the remaining curves quickly deliver the ground corn or meal from between the grinding surfaces; and by thus keeping the working lines or grooves free from meal, the introduction of a current of air is facilitated.

To quicken the delivery of the meal from the stones, it is proposed, in some cases, to have additional short curved lines made near the periphery of the stone, as shewn at fig. 2, set midway between the others, and extending inwards as far as the commencement of the outer curves.

The patentees claim the employment of grinding surfaces with compound curved lines or grooves formed thereon, as above shewn and described.—[*Inrolled January*, 1853.]

To Joseph Martin, *of Liverpool, in the county of Lancaster, rice miller, for improvements in machinery and apparatus for cleansing and otherwise treating rice and certain other grains, seeds, and farinaceous substances.*—Sealed 16th November, 1850.]

The first part of this invention consists in the employment of what the patentee terms "worm-cylinders," for washing and drying grain, seeds, and other farinaceous substances; for washing, drying, and calcining starch, flour, and farina; and for roasting or washing coffee berries.

In Plate VI., fig. 1, is a longitudinal section of the kind of

cylinder which the patentee prefers for drying. The outer casing *a*, may be made of wire gauze, sheet metal, or any other suitable material, and is supported at each end by arms *b*, from the axis *c*. Within the cylinder is placed the worm or screw-partition *d*, affixed either to the casing or axis, as may be deemed advisable. The grain is introduced at one end of the cylinder, and, as the axis revolves, the grain is gradually impelled to the other end by the screw-partition,—the time occupied in passing from one end of the cylinder to the other depending upon the velocity of the cylinder and the pitch of the screw-partition.

Fig. 2, is a longitudinal section of the form of cylinder preferred to be used for washing grain or other farinaceous matters, which differs from that above described in having one end conical,—the length of such conical portion depending upon the nature and quality of the materials to be washed.

The second part of the invention relates to machinery for cleansing rice, splitting peas, and treating other seeds or grains, and consists in passing the seeds or grains between a fixed cork-wood surface and a revolving serrated surface, made of metal, stone, or other suitable substance.

Fig. 3, is a vertical section of a machine for cleansing rice or splitting peas or other seeds or grain. *a*, is the hopper; *b*, the shaker; and *c*, a tube or funnel, for conducting the seeds or grain between the surfaces *d*, and *e*. *d*, is the cork-wood surface, fixed to the stationary wooden disc *f*; and *e*, is the serrated surface, secured to the top of the revolving shaft *g*: in this case, the surface *e*, is supposed to be made of stone; but it may be formed of metal or any other suitable substance.

The patentee claims, First,—the modes above described, and shewn at figs. 1, and 2, of drying and washing grain, seeds, or other farinaceous matters. Secondly,—the mode above described, and shewn at fig. 3, of cleansing and shelling rice and splitting peas.—[*Inrolled May*, 1851.]

To Edward Hammond Bentall, *of Heybridge, in the county of Essex, ironfounder, and* James Howard, *of Bedford, ironfounder, for improvements in the mode of chilling cast iron.*—[Sealed 22nd April, 1852.]

This invention has reference to a mode of regulating the temperature of chills or iron moulds used in casting articles in iron,—the object being to prevent the chills from overheating, and thereby enabling the operator to run his metal

more frequently than heretofore. In order to cast articles in iron moulds with rapidity, as, for example, ploughshares, or the breasts of ploughs, it has been usual, after every casting, to reduce the heat of the moulds by throwing water upon them; but, by thus suddenly cooling the moulds, they are very liable to crack, owing to the unequal contraction of the metal. To prevent this deterioration or destruction of metal moulds, and at the same time to keep them as nearly as possible to an equable temperature, so as to admit of a large average number of good castings being made in a given time, the patentees employ a new construction of metal moulds or chills, through which a current of refrigerating medium circulates, for the purpose of rapidly absorbing the heat of the molten metal when poured into such moulds.

In Plate VI., is shewn, by way of illustration, the kind of moulds employed in the manufacture of ploughshares. Fig. 1, is a plan view, and fig. 2, an edge view of a metal mould, constructed according to this invention. It consists of two principal parts, *a* and *b*; the part *a*, being the matrix or counterpart of the upper surface of the share, or that surface which is desired to be chilled; and the part *b*, a plate, which is bolted to the sides of the part *a*, and thereby forms a chamber beneath the matrix. At or near the middle of this plate an entrance is made to the chamber by a pipe *c*; and vents are made in the side of the mould, as at *d*, *d*. The pipe *c*, is intended to conduct a stream or blast of air from a fan or other pneumatic apparatus to the under side of the matrix, which, on the running of the molten metal into the mould, will become immediately heated, but by reason of the current of air passing beneath, it will be made to part with a great portion of that heat, which will be carried off by the escape of the air through the vents *d*, *d*; and thus, though the casting operation be continued for any length of time, the temperature of the moulds may be prevented from rising to an undue degree. Instead of driving a blast of air into the chamber, as explained, to extract the heat from the mould, the like object may be effected by means of an exhaust apparatus. Fig. 3, shews in plan view and fig. 4, in cross section, taken in the line 1, 2, of fig. 3, the form of hollow mould which it is preferred to use for casting chilled iron shares, when water is employed as the refrigerating medium. In this instance, instead of making the mould with a chamber extending below the whole face of the matrix, the mould is cast in one piece, and a chamber *e*, *e*, the capacity of which is indicated by dots in fig. 3, is cored out. Entrance and exit holes are made

at *f*, and *g*, for the passage of a stream of water through the chamber.

It is important to remark, that, in order to prevent the rapid generation of steam in this chamber, by reason of the heat which the water is calculated to imbibe from the molten metal, there should be a sufficient pressure on the water to cause it to traverse quickly along and through the chamber; and in all cases, no matter what the form of the article to be cast in chilled iron, the chamber or channel for the water should be such as to prevent any portion of the stream of water harbouring therein, and thereby steam being allowed to accumulate in the hollow mould, to the risk of destroying it, besides interfering with or retarding the cooling operation.

When preparing moulds for casting the breasts of ploughs in chilled iron, more especially when water is used as the refrigerating medium, it is preferred to core out a zigzag passage of uniform capacity in the mould, or to cast the mould with a wrought-iron pipe running in a serpentine direction from one end to the other, as shewn at fig. 5: by which means a large cooling surface will be provided, and the disadvantages above pointed out will be avoided.

The invention is said to be applicable in all cases where the chilling of cast-iron is effected, as a means is not only provided for facilitating the operations of the founder and preventing the deterioration of the moulds, consequent on the present plan of cooling them with water, but a more uniform temper of metal will be obtained, owing to the equable temperature of the moulds when the casting takes place.

The patentees claim the mode of chilling cast-iron, as above set forth, in all or any of its modifications.—[*Inrolled October*, 1852.]

To Arthur Wellington Callen, *of Peckham, in the county of Surrey, Gent., and* John Onions, *of Southwark, in the county of Surrey, engineer and iron-founder, for improvements in the manufacture of certain parts of machinery used in paper-making, and certain parts of railways, railway and other carriages.*—[Sealed 14th February, 1852.]

This invention consists, firstly, in forming, moulding, or otherwise constructing metallic bars and plates, employed for pulping rags in the manufacture of paper, in such manner that the said plates or bars shall be less subject to wear than those at present in use,—that is to say, instead of forming the pulping bars or plates of rolled or beaten iron, as heretofore, the pa-

tentees cast the said bars or plates, in suitable moulds, from malleable cast-iron or hæmatite ore. They also construct the smooth surface rolls, for glossing and finishing paper, of cast malleable iron.

The next part of the invention consists in the application of the said process of casting in malleable iron from the hæmatite ore to the manufacture of railway chairs and sleepers, so as to render them less liable to fracture than when, as at present, the metal is used in a crude and brittle state.

Lastly, the invention consists in the application of the same method of casting to the manufacture of all descriptions of working bearings for railway and other carriages, and in case-hardening such portions of the same as are most subject to friction.

The patentees claim, First,—the casting of the said metallic bars and plates employed in pulping rags, in the manufacture of paper, in cast malleable iron from the hæmatite ore, as aforesaid; as also the glossing or finishing paper rolls, as aforesaid. Secondly,—casting, as aforesaid, railway chairs and sleepers in hæmatite ore or malleable iron. Thirdly,—the casting of railway carriage and other bearings, as aforesaid, in malleable iron.—[*Inrolled August*, 1852.]

Scientific Notices.

INSTITUTION OF CIVIL ENGINEERS.

February 1st, 1853.

The paper read was "*On the pneumatics of mines*," by Mr. Joshua Richardson, M. Inst. C.E.

The author, after shewing the discrepancy existing among the various systems of ventilation, which might be traced to the want of good formulæ for the necessary calculations, strengthened his position by the evidence given in the Reports of the Parliamentary Committees, and of that at South Shields, in 1843. He explained the usual modes of calculation, and demonstrated, that many more points required to be considered, than were ordinarily admitted to bear on the question, and that no sound basis of calculation could be formed on any one of the various elements, but that the whole must be carefully considered, after having examined each element in detail.

The chemical constitution and properties of atmospheric air were then considered, its uses in the animal economy, its adulteration by deleterious gases, and the compensating action provided by nature, for restoring it to its primitive purity.

The principles of combustion were defined, and calculations were given, for determining the amount of atmospheric air required for supporting combustion and animal respiration, and for compensating for the amount of deterioration by perspiration. The several quantities of air practically required in mines, for the healthful support of men and horses, were carefully shewn, with the modes of calculating—allowing for the distance the air must travel.

Then followed the analysis of the deleterious gases existing in mines; the fire-damp, choke-damp, and after-damp,—with the quantity of atmospheric air required to dilute these vapours, so as to render them innocuous, or to promote such ample ventilation as to sweep them away from the galleries of the mines.

A description was given of the "Eudiometer," and of the method of using it, to discover the quantity of oxygen, and the per centage of carburetted hydrogen, or other gases, contained in the air of any part of a mine. The solution of chlorine in water, determines the quantity of hydro-carbonate or fire-damp present; that of green sulphate of iron, impregnated with nitrous gas, the relative quantity of oxygen; and that of lime water (or better, caustic potassa, or baryta), the relative admixture of carbonic acid.

The absolute necessity for diluting the fire-damp with, at least, thirty times its volume of atmospheric air, and forcing it out of the mine with rapidity, was insisted on, and examples given of explosions occurring apparently from the most opposite causes; still however traceable to the same source—a deficiency of ventilation.

The diagram of Dr. Clanny's clever analysis of fire-damp was given and reasoned on; and the precautions to be observed on entering a mine, after an explosion, were detailed at length, as more men were generally killed by the after-damp, than by the explosion itself.

Calculations were given, for determining, from the previous data, the quantity of air actually required in mines, taking into consideration the number of men, horses, and lights, the presence of deleterious gases, the increased temperature, the difference of barometric pressure, and the length of the galleries through which the air coursed. The results were shewn in tabular forms; and simple rules were deduced for determining the quantities required, under all circumstances of varying per centage of deleterious gases, &c.

February 8th, 1853.

The evening was entirely devoted to the discussion of Mr. Richardson's paper, "*On the pneumatics of mines.*"

The discussion was commenced, by an allusion to the very different conditions of the ventilation in the mines and collieries of the various districts of Great Britain. Some had humane proprietors, educated engineers, and intelligent overlookers, by whom all scien-

tific and practical knowledge was brought to bear on the question. Others were worked by men who cared little for anything beyond mere gain, and went on without other supervision than that of the most ignorant overmen, by whom matters were allowed to fall into a bad state; the whole being entirely dependent on "natural ventilation," by which was meant, merely sinking two pits, one intended for the down-cast and the other for the up-cast; and the motion of the air being determind only by the difference of temperature of the two shafts.

The quantities of atmospheric air necessary for the healthful condition of mines, under various circumstances, were then given, as being in round numbers 100 cubic feet per man per minute, for mines free from deleterious gases, up to as much as 500, or even 600 cubic feet, in very fiery and bad mines.

The various means of forcing air into and exhausting air from mines were then explained,—more particularly touching on the "water blast" used in the Hartz mountains in Belgium, by which it appeared that long galleries were very rapidly cleared, even of powder smoke. Gurney's steam jet, Struve's aerometer, Combe's curved arm fan, the pneumatic screw, and the ordinary exhausting or rarifying furnace, were compared; and it was contended, that though the furnace was the simplest system, there were occasions when, from its action not being susceptible of acceleration, it would be ineffective in rapidly clearing a mine after an explosion; whereas, by increasing the velocity of Struve's aerometer, its active power would be rendered so much more effective, that the mine would be immediately cleared, even in spite of the destruction of the brattice, or of the gallery doors. The accident at the Middle Dyffryn Colliery, caused by the explosion of the gas at the exhausting furnace, was explained to have arisen, most probably, from the introduction of such a large quantity of atmospheric air, as brought the air in the mine to its explosive condition. This most frequently occurred in new mines, and where, generally, every attention was paid to copious ventilation.

Constant attention to the indications of the barometer was enforced, as the best mode of avoiding accident; and it was shewn, that however well anemometers might be constructed, it was necessary to make an allowance for friction, and to have them well compared and regulated, before trusting to them.

The existence of a condition of "natural ventilation" was strongly contested. It was urged that such a state was not compatible with any security; as the difference between the columns must depend on the deterioration of the air in the mine, by the breath and the animal exudations of the men, and other causes; the current must become sluggish at night, when the mine was not working; the course of the ventilation might suddenly change, with the direction of the wind, and all the ventilating arrangements would be rendered of no effect.

Attention was directed to the Institute of Mining Engineers,

recently established at Newcastle-on-Tyne, under the presidency of Mr. Nicholas Wood (M. Inst. C.E.); and it was hoped that by its means, knowledge might be more extensively spread among that valuable class, the overmen of the North, whose practical skill only required to be allied to a little more scientific knowledge, to render them a most useful class whence to draw the overmen for other districts, where there was still a lamentable deficiency of knowledge and practical skill.

February 15, 1853.

The paper read was "*On the use of heated air as a motive power,*" by Mr. Benjamin Cheverton.

The author, in a short historical notice, stated that Sir George Cayley had written on the subject in 1804 and 1807, and had subsequently built several engines; but Messrs. Stirling, of Scotland, produced the first really efficient engine, working by means of heated air, in the year 1827. In the same year Messrs. Parkinson and Crosley brought forward their air engine; and Mr. Ericsson, following more closely the arrangements and form of the ordinary steam-engine, constructed an air or a "caloric engine," as it was termed, in 1833. Messrs. Stirling patented further improvements in 1840, and in 1845 their engine was described to and discussed at the Institution of Civil Engineers: in 1851 Mr. Ericsson brought forward his present form of engine. The principle acted upon in both these latter inventions, and announced as an important discovery in motive mechanics, was shewn to be the reiterated use of the same caloric in the production of power. The mechanical means of realizing this idea were described, and it appeared that in both inventions they were substantially identical. The ejected hot air, by being brought into contact with an extensive metallic surface of wire gauze, was deprived of its heat, which the next moment was imparted to the incoming cold air; and thus the ultimate use of the furnace was only to supply the unavoidable waste of caloric by radiation.

This view of the subject was strongly contested, as being inconsistent with the best established laws of nature, and as involving the idea of the possibility of the creation of power. It was argued, at some length, that the employment of caloric as a motive agent, consisted in the development, from molecular forces, of a dynamic force, and as such, was directly amenable to the third law of motion—that of action and reaction being equal and opposite. It was contended, that sensible caloric was not an indication of the presence, but of the abeyance of mechanical action; that these were interchangeably convertible quantities; and consequently, that a working force could appear only as heat disappeared—a conclusion entirely opposed to the assumed principle of the caloric engine, that "caloric could be made to operate over

and over again." It was admitted, however, that there was an apparent anomaly in the application of the law of action and reaction, when caloric was in question, in the fact, that its quantity was not less after than before the generation of steam power, if it were estimated conjointly by water and temperature. But it was explained, that a cause might have two classes of effects, and might require two distinct and different measures to indicate its entire efficiency; that while caloric might remain intact, under the aspect adverted to, it lost by a declination in the intensity of its temperature, for which the equivalent gain was a dynamic force—a conclusion as adverse as before to the idea that such force could be acquired without cost. It was, in short, in the aspect of a *vis viva* "force" in caloric, that the development of mechanical action must be considered. These views were further explained and illustrated by a reference to the analogous difference between momentum and the more practical modification of power, named by Smeaton and Watt, "mechanical power," "work," and "duty;" and it was shewn, that here also an apparent discrepancy existed in relation to the third law of motion, but which was cleared up when both the measures of power—that by time and that by space—were appropriately used.

It was contended, that the caloric engine was analogous to a non-expansive high pressure steam-engine, which it would exceed in wastefulness of heat, if it were not provided with, what its inventor improperly termed a "regenerator;" the office of which, it was insisted, was simply to absorb the unutilized sensible caloric of the escaping air (which, as compared with steam, was in very large proportion to the efficient caloric), and to afford another opportunity for its being converted into force,—thus compensating for the loss of expansive pressure. An explanation, founded on these considerations, was given of the continued action of the engine for some time after the fire was withdrawn—a fact which had been advanced in support of, what was styled, the untenable hypothesis of a "regenerator of force."

Although the mechanical effect of heat might be proved to be independent of the chemical condition, if not, also, of the physical constitution of bodies, it was admitted, that economy of fuel, as being a distinct question from that of economising the caloric already in possession, was eminently a practical matter, only to be determined by experiment; and in this point of view it was explained, in what manner the reception of heat, at a much higher temperature than steam, was greatly in favor of air as a motive agent; but, on the other hand, many adverse considerations were adduced, tending to shew the impracticability of the system, in its present form.

In conclusion, it was shewn, that the caloric engine did not rest on true principles, exclusively its own,—that its merits stood upon common ground with those of the steam-engine—and therefore, that even should the performances of air be found

superior to those of steam, could it not be anticipated that the former would immediately supersede the latter; but, as far as public statements could be relied on, the performances of the air-engine on board the "caloric ship," *Ericsson*, were very unfavorable to the pretensions of the promulgators of the plan.

The discussion was commenced by an exposition of the several systems adopted by Sir G. Cayley, Stirling, Parkinson, Crosley, and Ericsson, illustrating them by diagrams; whence it appeared, that the most preferable mode of heating the air was that of Sir G. Cayley, by directly traversing the incandescent fuel; that the great improvement recently introduced by Ericsson, was the wire gauze regenerator, which however formed an integral part of Stirling's original design. The practical difficulties of the immense dimensions of the heating vessels and cylinders, and the rapid destruction of the metallic parts, were fully considered; and it was admitted, that although, at present, there did not appear to be any positive recorded results more advantageous than by the use of steam, it would be wrong to discourage the attempt to use heated air, and to overcome the inherent difficulties of the system.

Allusion was made to the appendix to a Tract published by Mr. A. Gordon, wherein it was shewn, that the volume of the gases into which one cubic foot of Anthracite coal was decomposed, under atmospheric pressure, was 219,250 cubic feet; that the volume of air required to sustain combustion was 14,273 feet; and the mechanical power developed was 473,000,000 lbs., raised one foot. It was proposed by Mr. Maxwell Lefroy to pass these gases through water, in order to purify them from grit, &c., and to cool them to a convenient temperature, and then to use them together with steam, in power cylinders. He proposed a system of co-axial cylinders, of which the central one was the furnace; the two next were cylindrical shell boilers; the water in the inner one of which completely covered the surface of the furnace, and that in the outer one was always below the insertion of the gas pipes in the furnace: the exterior shells were for the purpose of gradually heating the air, in its passage to the furnace, so that the exterior shell, which alone sustained the bursting pressure, was always cool. About one-seventeenth part of the power produced would be expended in forcing in the air required to sustain the combustion of the fuel. The coal-hopper was co-axial with the furnace, and was kept cool by the supply water descending through its hollow shell into the interior. The system would be one of high pressure; and some of its advantages were assumed to be, the absence of a funnel, saving of three-fourths of the fuel, safety from explosion, with economy of first cost, space, and labour.

February 22, 1853.

The evening was entirely devoted to the renewed discussion of Mr. B. Cheverton's Paper, "*On the use of heated air as a motive power.*"

The construction of Ericsson's engine, and the application of the regenerator were first described; and it was then argued, that the action of the regenerator almost amounted, theoretically, to the creation of force, and that it was not of the utility that had been presumed. From the best accounts, it appeared that various practical difficulties existed in the application of heated air as a motive power; and from calculations which were entered into, it was shewn, that, the mean pressure of the air in the working cylinder being 4½ lbs., and the engines making eleven strokes per minute, a total power was developed, which, after making a proper deduction for friction and waste, did not exceed 208 H.P. with the cumbrous machinery which was described. It was then contended that with such a fine model of a ship, and under the circumstances of the experiments, a greater speed than seven miles an hour ought to have been attained, with a less expenditure of fuel, and that therefore, at present, the caloric engine could not be practically regarded as a successful invention.

Tables and diagrams were exhibited, for the purpose of shewing the relative amount of power obtainable from a given quantity of heat, applied in expanding air and in producing steam, shewing that, after taking into account all the conditions of each case, the useful effect would be nearly the same, independently of the regenerator, which if not a fallacy, would turn the scale in favor of the use of heated air.

It was submitted by other speakers, that the machine involved a mechanical fallacy, as the generator produced no mechanical effect whatever. It might be granted, that the regenerator of Ericsson's engine received and redelivered the heat, in the manner described,—that when the working piston was descending, the heat was deposited, and that when ascending, the heat was restored; but that operation could only result as a consequence of the motion of the piston, and not as a cause of its motion—hence no mechanical effort was made. This result was easily shewn, by assuming the contents of the pump to be 1, and the contents of the working cylinder to be 2. If the working piston was at the bottom of the cylinder, and in equilibrium with the external atmosphere, as regarded the pressure on a unit of surface, and then began to move, and the air to be heated, in its passage through the regenerator, from 32° to a temperature of 512°, so as to double its volume, the lower piston would constantly produce a vacuity, so to speak, of 2, to be constantly fed by a supply of 1, from the pump, expanded into 2, by the increase of temperature—consequently the piston, at every instant of its motion, remained in equilibrium with the external atmosphere, and no

mechanical effect could result. Still in Ericsson's engine a mechanical effect had been produced; but then this mechanical effect was no greater than would be produced without the aid of the regenerator, by the simple action of the furnace itself, and not so economically as by the use of steam.

Further investigations were entered into of the theory of the air engine; and the general result appeared to exhibit so much distrust of the accounts already received of the working of the caloric ship, that it was suggested, that the further discussion of the subject should be adjourned for a few weeks; and meanwhile another paper was proposed to be written, so that the question could be more fully discussed on the next occasion.

ON THE CAUSES OF RAIN AND THE POSSIBILITY OF MODIFYING THEM BY ART.

BY MR. DANIEL VAUGHAN.

THAT electricity partakes of the power of sustaining vapor in the atmosphere is evident from several facts. When allowed to evaporate, the surface of water is not only cooled, but is also rendered negatively electric, while the vapor itself is positive. From this it appears that the vapor is formed at the joint expense of heat and electricity. Experiments also prove that evaporation is retarded whenever the water is insulated; a result which shews more conclusively the part which the electric fluid acts in the production of vapor. Accordingly the amount of watery vapor which the atmosphere can contain, depends not only on its temperature, but likewise on its electricity, which, according to all experiments, is much increased in intensity at great elevations, and here its its agency becomes important as that of heat declines. The evaporation of water and the friction of the air against the surface of the earth, are commonly regarded as the principal sources of atmospheric electricity; and, to render the mechanism of nature more effective for its development and for confining it to the upper regions, an insulator is provided by means of the lower stratum of air which is most free from humidity, for the moist air continually ascends on account of its inferior specific gravity.

It is well known that positive electricity is always liberated whenever vapor is condensed; and, should its escape be prevented by insulation, the condensation will, of course, be retarded. The non-conducting power of the lower stratum of air will, therefore, be the means of keeping the aqueous vapor dissolved in the atmosphere until the insulation is broken by the near approach of humidity to the earth's surface or by other causes. The electricity being then no longer confined by a proper barrier, should escape to the earth: the portion of vapor which was dependent on its support, should condense, and, in most cases, descend as rain;

while, at the same time, the drops in approaching the surface of the earth, should saturate the earth with moisture, and thus furnish a means for the more rapid discharge of electricity and the more complete precipitation of the superfluous water of the atmosphere.

In consequence of the humidity of the atmosphere, mountains withdraw electricity from a considerable distance; and by causing the descent of rain, open numerous channels by which the electric fluid passes from much greater distances to the adjacent lowlands. The indirect influence of mountains, therefore, extends many miles around them, and hence it is that they do not themselves receive as much rain as the plains and valleys in their vicinity, though their effect on its production is too obvious to be doubted. In the vast island or continent of Australia, which contains no mountains, years sometimes elapse without a shower; a cloud on the sky is regarded as a phenomenon; the rivers are all too insignificant for navigation, and most of them are quite dry during eight months of the year. A single river of the mountainous region of South America, contributes more water to the ocean than all the rivers of the continent of Africa, which is much more extensive. Even the principal African rivers rise in the highlands under the equator; they receive scarce any accession of water from the lower districts.

The part which trees take in the removal of electricity from the upper regions, is far greater than might be expected from their moderate elevation. They increase the quantity of rain, and cause it to fall in gentle and seasonable showers, instead of coming in rare and violent torrents. That the destruction of forests is attended with a diminution of rain, is a fact proved beyond doubt, from observations made on this continent; and, according to Humboldt and Boussingalt, the same result is visible in South America.

From the result of the experiments of nature, it is evident that by discharging the electricity in the upper part of our atmosphere, we may deprive rain of its injurious effects, and not only render it more beneficial to our wants, and to the purposes of agriculture, but even extend those benefits to the sandy deserts and redeem them from their present sterility. The construction of lightning rods on a scale sufficiently large for this purpose, would be attended with the greatest difficulties. A momentary communication with the imprisoned electricity is all that is desirable. A temporary communication may be most readily formed by projecting a considerable body of water into the atmosphere by the means of the expansive force of condensed air, or of carbonic acid subjected to a pressure. The following plan, says Mr. Vaughan, for this purpose, seems best calculated to allow the elastic forces sufficient time for action, and to obviate the difficulty of permitting the water to escape at once from an enormous pressure through a large orifice with a sufficient velocity.

Let a large tube of the form of the letter U, or of a semicircle, be constructed, and let it be placed with both ends upright and one of them permanently closed. The other end is to be stopt air-tight by means of a large valve, which presses against its mouth, and turns on an axle when opening, while it is secured on the other side by a lever, so arranged that, on the fall of a weight on its remote extremity, it loses its hold on the valve and allows it to open. At a short distance below this valve, let the tube communicate with a strong vessel, in which carbonic acid is prepared by the action of sulphuric or muriatic acid on carbonate of lime, or with a condenser if air be employed. Having introduced water in the tube, in a quantity sufficient to fill one-sixth of its capacity, the valve must be closed, and the apparatus arranged for the introduction of the air or carbonic acid into the confined space. The gaseous mixture, after forcing the water in the closed end of the tube above its former level, will rise through it in bubbles, filling the space over it and attaining nearly the same density as in the other end. When the pressure becomes as great as the strength of the tube will permit, the valve being allowed to open, one part of the confined air or gas escapes and clears the orifice for the exit of the water, which is driven into the air by the expansion of the other part of gaseous mixture in the remote extremity of the tube.

From a cast-iron tube 200 feet long, 20 inches in diameter, and 2 inches thick, a cylindrical column of water thirty feet long may be in this manner launched into the air, with a velocity of over 700 feet a second; and, if not prevented by the air, it should reach an elevation of nearly 8000 feet.

The effect of such a discharge, like the influence of a mountain, must extend to a distance of several leagues; and it would not be rash to expect that in this manner, the irregularities in the supplies of rain throughout the habitable globe, may be corrected with much less labour and expense than was bestowed on one of the artificial mountains of Egypt.—[*Scientific American.*]

LIST OF GRANTS OF PROVISIONAL PROTECTION UNDER THE NEW LAW.

Cases in which a full Specification has been deposited.

145. Georges Edouard Gazagnaire, of Marseilles, for improvements in the manufacture of nets for fishing and other purposes,—a communication.—January 20.

182. Warren Fisk Shattuck, of the Strand, engineer, for a smut machine,—a communication.—January 25.

184. Thomas Ovans, of Dublin, shopman, for improvements in the manufacture of boots.—January 25.

209. Casimir Noël, of Paris, for a new regulating bit.—Jan. 28.
242. George Twigg and Arthur Lucas Silvester, of Birmingham, manufacturers, for improvements in apparatus for cutting and affixing stamps and labels,—partly a communication.—Jan. 29.
250. Walter Williams, jun., of West Bromwich, iron-master, for improvements in machinery for cutting or shearing iron and other metals.—January 31.
268. Thomas Charles Clarkson, of Wapping, manufacturer, for improvements in the manufacture of hats, caps, and bonnets; which improvements are also applicable to other articles of wearing apparel.—January 31.
328. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in metal musical wind instruments, to be called "Besson's System,"—a communication.—February 5.

Cases in which a Provisional Specification has been deposited.

1052. William Irlam, of Manchester, engineer, for improvements in railways.—[*Dated December* 14*th*, 1852.]
2. Henry Bentley, of Spilsby, for vulcanized India-rubber springs for trousers and breeches, with instructions to adjust the same.—[*Dated January* 1*st*, 1853.]
35. Edme Augustin Chameroy, of Paris, for a new composition of different metals or metallic substances.—[*Dated Jan.* 6*th*.]
57. William Henderson, of Bow-common, for improvements in manufacturing sulphuric acid and copper from copper ores, reguluses, and matts.—[*Dated January* 8*th*.]
69. Joseph Beattie, of Lawn-place, South Lambeth, engineer, for certain improvements for economizing fuel in the generation and treating of steam.
70. William Weild, of Manchester, engineer, for certain improvements in looms for weaving.
71. Henry Constantine Jennings, of Great Tower-street, chemist, for improvements in separating the more fluid parts of fatty and oily matters.
72. James Thornton, of Derby, mechanic, John Thornton, of Melbourne, mechanic, and Albert Thornton, of the same place, mechanic, for improved nets and other textile fabrics, to be used for gloves and other purposes, and for the machinery to be employed in the manufacture thereof.
73. Joseph Robert Wilkin Atkinson, of Leeds, flax spinner, for improvements in machinery for preparing and spinning flax, tow, and other fibrous substances.
74. Thomas Cottrill, of West Bromwich, for improvements in the manufacture of certain salts of soda.
75. John Petrie, jun., of Rochdale, ironmonger, and Samuel Taylor, of the same place, mechanic, for improvements in machinery or apparatus for washing or scouring wool.

The above bear date January 11*th*.

76. John Horrocks, of Seacombe, accountant, for improvements in indicating and registering the number of passengers conveyed in public carriages.
77. John McDowall, of Johnstone, North Britain, engineer, for improvements in cutting or reducing wood and other substances.
78. Nathaniel Card, of Manchester, candle-wick manufacturer, for certain improvements in candle-wick.
79. John Hick, of Bolton-le-Moors, engineer, for certain improvements in the method of lubricating revolving shafts and their bearings or pedestals.
80. James Fletcher, of Facit, near Rochdale, for certain improvements in machinery applicable to spinning, doubling, and winding of cotton, wool, flax, silk, and other fibrous materials.
81. William Bryer Nation, of King's Norton, chemist, and Joseph Dyer, of Birmingham, manufacturer, for an improvement or improvements in the manufacture of soap.
82. John Arrowsmith, of Bilston, engineer, for new or improved machinery for shaping metals.
83. George Augustus Huddart, of Brynkir, Esq., for improvements in the manufacture of artificial leather.
84. George Augustus Huddart, of Brynkir, Esq., for improvements applicable to steam generators.
85. William Nairne, of Perth, flax spinner, for improvements in in reeling yarns or threads.
86. Edward Haslewood, of Tufnel Park, Holloway, for improvements in fire-arms and projectiles,—being a communication.
87. John Capper, of Earl's-court, Old Brompton, and Thomas John Watson, of Devonshire-terrace, Fulham-road, chemist, for improvements in preparing and bleaching jute and other vegetable fibres.
88. Frederick Lawrence and Alfred Lawrence, of Pitfield-street, Old-street-road, for improvements in sluices and lock gates.
89. John Bennett, of Huddersfield, woollen manufacturer, and Henry Charlesworth, of Huddersfield, card manufacturer, for improvements in doffing and preparing rovings of wool.

The above bear date January 12th.

90. Moses Cartwright, of Longton, Stafford, for an improvement or improvements in the preparation or manufacture of gypsum or plaster of Paris.
91. Charles Bullivant, of Birmingham, manufacturer, and Charles Hackney, of Balsall Heath, near Birmingham, mechanic, for an improvement or improvements in certain kinds of spoons and ladles.
92. William Brown, of Glasgow, for an improved method of treating coal and bituminous substances, and for improvements in the treatment of their volatile products.
93. John Rumley, of South Shields, for certain improvements in pumps.

94. Edward Wills Uren, of Walkhampton, Devonshire, for the manufacture of bricks, pipes, tiles, imitation stone, and peat bricks for fuel, by the means of a machine and arrangements of machinery, titled "a central circular and horizontal motion."
95. George Fife, of Newcastle-upon-Tyne, M.D., for improvements in protecting vessels and exposed surfaces from injury or decay.
96. John Walker Wilkins, of Hampstead, electric telegraph engineer, for improvements in electric telegraphs, and in the instruments used in connection therewith.

The above bear date January 13th.

97. Joseph Lillie, of Manchester, engineer, for improvements in machinery to be used in the process of malting, drying, and seasoning grain,—including certain vegetable and other substances.
98. Richard Taylor, and Hezekiah Henry Salt, both of Birmingham, for improvements in the manufacture of spoons and ladles.
99. Arthur James, of Redditch, Worcestershire, for improvements in means of enclosing needles.
100. John Henry Vries, of Fleet-street, M.D., for improvements in obtaining motive power.
101. William Steads, of Redcross-street, in the county of Leicester, for improvements in blinds, maps, charts, and other articles wound on rollers.
102. Frederick Joseph Bramwell, of Millwall, engineer, and Isham Baggs, of Liverpool-street, engineer, for improvements in steam machinery used for driving piles, hammering, stamping, and crushing.

The above bear date January 14th.

103. James Stewart Kincaid, of Dublin, Gent., for improvements in ascertaining and registering the number of persons entering or quitting omnibuses or other vehicles or vessels; which improvements are applicable, in whole or in part, to buildings or other places.
104. William Bailey, of Manchester, engineer, for improvements in the construction of certain parts of apparatus connected with railway signals, and in the mode or method of working the same.
105. Edward Tasker, of South Hackney, for an invention for the purposes of writing and drawing, called "the writing and drawing tube."
107. James Hadden Young, of College-street, Camden Town, for improvements in brooms or brushing apparatus.
108. Peter Alexander Halkett, of Richmond-hill, Lieut. R.N., for an improved construction of inkstand.
109. John Arrowsmith, of Bilston, engineer, for certain new or improved pumping machinery.

The above bear date January 15th.

110. Thomas Potts, tube manufacturer, and James Septimus Cockings, civil engineer, both of Birmingham, for improvements in the manufacture of tubes, and in the application of tubes to certain purposes.
111. Thomas Cropper Ryley, of Haigh Foundry, near Wigan, engineer, and Edward Evans, of the same place, engineer, for certain improvements in the construction of wrought iron wheels, to be used upon railways or for other purposes, and in the machinery or apparatus connected therewith.
112. Alexander Yorston, of Belfast, engineer, for improvements in the construction and arrangements of parts of railways.
113. William Nairne, of Perth, flax spinner, for improvements in power looms.
114. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in the manufacture of batting or wadding,—being a communication.
115. Auguste Loradoux Bellford, of Castle-street, Holborn, for improvements in the manufacture of blocks for printing music,—being a communication.
116. Adolphe Iglesia, of Upper John-street, Fitzroy-square, for improvements applicable to machinery or apparatus for reeling or winding silk, cotton, or other fibrous substances, for the purpose of measuring or gauging the same,—being a communication.
117. Henry Henson Henson and William Frederick Henson, both of Hampstead, civil engineers, for improvements in signalizing on railways, and in the apparatus used therein.
118. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for an improved machine for obtaining motive power,—being a communication.

The above bear date January 17th.

119. Christopher Binks, of North Woolwich, for improvements in producing electric light.
120. John Thornborrow Manifold and Charles Spencer Lowndes, of Liverpool, engineers, for improvements in steam-engines.
121. Henry Browning, of Bristol, painter, for improvements in preparing compositions for coating iron and other ships' bottoms, and other surfaces.
122. Frederick George Underhay, of Wells-street, Grays-inn-road, engineer, for improvements in machinery for mowing or cutting corn and other crops.
123. Orlando Reeves, of Taunton, for improvements in the manufacture of manure.
124. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for an improved sewing machine,—being a communication.
125. Peter Fairbairn, of Leeds, machinist, and Samuel Renny Mathers, of Leeds, flax spinner, for certain improvements in

machinery for drawing the sliver and rove of flax, hemp, and tow.

126. Thomas Lees, Squire Lees, John Lees, and Thomas Lees, jun., all of Stockport, engineers, for improvements in apparatus for admitting water to boilers.

127. John Sheringham, of Edwardes-square, Kensington, for certain improvements in stove-grates.

128. Robert Neale, of Cumming-street, Pentonville, engraver, for improvements in the process of copper and other plate and cylinder printing, and inking, and wiping, and polishing by machinery the engraved plates and cylinders whilst used in the process.

The above bear date January 18th.

129. William Vincent, of Brick-lane, Spitalfields, for improvements in cocks or taps.

130. Sydney Smirke, of Berkeley-square, for improvements in apparatus for giving signals on railways.

131. Joseph Rock Cooper, of Birmingham, gun maker, for improvements in fire-arms.

132. William Francis Snowden, of King's-cross, mechanist, for an improved mangle.

133. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in lamps or lanterns,—being a communication.

134. Thomas Judge, of High-street, Hampstead, watchmaker, for improvements in propelling vessels.

135. Celestin Malo, of Dunkerque, ship builder, for improvements in steam generators.

136. Joseph Maudslay, of Lambeth, engineer, for improvements in steam-engines; which are also applicable wholly or in part to pumps and other motive machines.

The above bear date January 19th.

137. John Crabtree, of Heywood, cotton spinner, for improvements in machinery for winding and doubling yarns.

138. Peter Rothwell Jackson, of Salford, engineer, for improvements in the manufacture of hoops and tyres for railway wheels and other purposes.

139. John Whiteley Ward, of Halifax, stuff manufacturer, for improvements in the manufacture of woven or textile fabrics.

140. Cornelius Ward, of Great Titchfield-street, musical instrument maker, for a new construction of the musical instrument designated the bassoon.

141. Cornelius Ward, of Great Titchfield-street, musical instrument maker, for combining the musical instruments designated the drum and the cymbals, in such manner as to make them as one instrument; which instrument he terms the "cymbal drum."

142. Richard Mountford Deeley, of Audman Bank, Staffordshire, glass manufacturer, for improvements in the grates of furnaces used in the manufacture of glass.

143. Horace de Manara, of Liverpool, for certain improvements and arrangements applicable to steam boats and other navigable vessels, for the purpose of preventing sea-sickness.

144. William Riddle, of East Temple-chambers, for improvements in ornamenting walls, ceilings, and other surfaces.

146. Augustus Thomas John Bullock, Lieut. R.N., for improvements in taps and cocks.

147. William Williams, of Eccleshall, engineer, for improvements in refrigerating apparatus.

The above bear date January 20th.

148. George Carter, of Eltham, for improvements in the construction of furnaces.

149. Eliezer Edwards, of Birmingham, for an improvement in the construction of knobs, handles, and other articles of glass, earthenware, and other vitreous and semi-vitreous substances, and in attaching the same to doors, drawers, and other articles.

150. John Addison, Capt. H.E.I.C.S., of Lawn-place, South Lambeth, for keeping up a communication between the guards and engine driver, and between the guards and passengers, by means of a lamp signal, which answers both for a day and night signal for a railway train.

151. Abraham Anton Meijsenheijm Knipsehaar, of the Hague, for an illuminated night clock.

152. George Thornton, of Gargrave, Yorkshire, civil engineer, for certain improvements in propelling vessels.

153. James Middlemass, of Edinburgh, for the application of a new material to the construction of portable houses and other buildings.

154. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements applicable to clocks and other time-keepers, for the purpose of indicating not only the time of the day but the day of the week, the month, and the year; which invention he intends to denominate "Hawes' calendar clock or time-piece,"—being a communication.

155. William Taylor, of How Wood, in the county of Renfrew, coal merchant, for improvements in the production and application of heated air.

156. Matthew Andrew, of Hyde, clerk, for certain improvements in fastenings for windows.

157. Alexander Prince, of Trafalgar-square, Charing Cross, for improvements in the manufacture of articles of furniture and other articles of a useful and ornamental character, by the use and application of a certain vegetable production belonging to the family of the cactus plant, and in the mode of treating and

preparing such vegetable production so as to render it available for the above purposes,—being a communication.

158. William Joseph Curtis, of Birchin-lane, civil engineer, for an invention for excavating or digging earth, and for carrying or delivering the soil.

159. Reuben Plant, of Brierly Hill, for improvements in the construction of glass-house furnaces.

160. John Chubb, of St. Paul's Churchyard, lock manufacturer, and John Goater, lock maker, for improvements in locks and latches.

The above bear date January 21st.

161. Louis Jules Joseph Malegue, of Paris, dyer, for a certain coloring composition for dyeing tissues, or stuffs of silk and cotton.

162. Benjamin Quinton, of Birmingham, for a new or improved fastening for brooches and other articles of jewellery and dress.

163. John Powell Matthew Myers, of Tenby, for improvements in the manufacture of artificial fuel.

164. William Sharples, of Bolton, for improvements applicable to apparatus used for marking and scoring at billiards and other games.

165. William Daniel Steevens, of Hart-street, Covent Garden, for an improved mode of signalizing or conveying alarum and other signals between one part and another of a train of railway carriages.

166. George Fife, of Newcastle-upon-Tyne, M.D., for improvements in safety-lamps; which improvements or parts thereof are applicable to other lamps.

167. John Medworth, of Campden-hill, Kensington, and Lawrence Lee, of New Oxford-street, for improvements in lithographic presses.

168. Joseph Paul, of Prairie Lowestoft, for improvements in machinery for making drains in land.

169. Peter Hubert Desvignes, of Lewisham, and Francis Xavier Kukla, of the same place, for improvements in galvanic batteries.

170. Arthur Wellington Callen, of Peckham, and Abraham Ripley, of Westminster-road, engineer, for an improvement in the modes of giving and transmitting multiplying rotative motion to shafts and other revolving bodies.

The above bear date January 22nd.

171. Henry Brinsmead, of St. Giles-in-the-Wood, Devonshire, machine maker, for an invention for reaping all kinds of corn.

172. Howard Ashton Holden, of Birmingham, manufacturer, Edward Bull, of Birmingham, agent, and Alfred Knight, of Birmingham, machinist, for a new or improved method of communicating between the guard and driver of a railway train.

173. Benoit Perreyon, of Paris, tailor, for a new mode of fastening buttons to garments, and an improved button; and also in machinery for manufacturing the same.

174. David Clovis Knab, of Paris, chemist, for improvements in the process of, and apparatus for, distilling certain vegetable and mineral matters, and also animal bones and flesh.
175. Donald Beatson, of Mile End, for improvements in the means of propelling ships and other floating vessels.
176. William Nairne, of Perth, flax spinner, for improvements in dressing yarns for looms.
177. Charles Randolph and John Elder, both of Glasgow, engineers, for imprövements in propelling vessels.
178. William Kendall, of Blawith, near Ulverston, wood turner, for improvements in the manufacture of boxes and similar articles, and in the machinery or apparatus to be employed therein.
179. John Henry Johnson, of Lincoln's-inn-fields, for improvements in aerial navigation, and in the machinery or apparatus connected therewith,—being a communication.
180. John Stevenson, of Dungannon, spinner, for improvements in machinery for spinning flax and tow.
181. Andrew Edmund Brae, of Leeds, for a method of communicating signals from one part of a railway train to another.

The above bear date January 24th.

183. Amédée François Rémond, of Birmingham, for a method of ornamenting articles of glass, enamel, and earthenware,—being a communication.
185. William Thomas Henley, of St. John-street-road, electrical engineer, for improvements in covering, laying, and uniting wires and ropes for telegraphic purposes, and in the machinery employed therein.
186. Freeman Roe, of the Strand, for improvements in paving roads and streets.
187. Frederick Simpson, of Red Hill, cement merchant, for improvements in combining materials for cleansing or whiteing stone.
188. John Sangster, of Cheapside, for improvements in umbrellas and parasols,—being a communication.
189. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for improvements in the manufacture of printing surfaces,—being a communication.
190. Joseph Wiggins, of Horner-street, Lambeth, chemist, for an improved cement for resisting moisture and damp.
191. Robert William Sievier, of Upper Holloway, and Robert William Waithman, of High Bentham, Yorkshire, for improvements in bleaching animal and vegetable fibrous materials.
192. Henry Habberley Price, of Neath Abbey, civil engineer, for improvements in raising and forcing water and other fluids.
193. John Edward Mayall, of Regent-street, photographist, for mprovements in the production of crayon effects by the Daguerreotype and photographic processes.

The above bear date January 25th.

194. Theodore Dwight Davis, of Castle-street, Holborn, for an improved valve for steam and gas engines.
195. Isaac Davis, of High Holborn, optician, for improvements in optical and mathematical instruments.
196. Antoine Galay Cazalat, of Paris, for a new barometer and steam-gauge.
197. Nicolas Francisque Ador, of Castle-street, Holborn, for improvements in preparing plastic materials, to be used in the manufacture of fired wares, and for other purposes.
198. Thomas Frederick Cashin and Joseph Stirk, of Sheffield, for a grinding machine.
199. Charles Nolet, of Ghent, watchmaker, for improvements in indicating time.
200. John Henry Johnson, of Lincoln's-inn-fields, for improvements in the method of lubricating machinery, and in the mechanism or apparatus employed therein,—a communication.
201. James Combe, of Belfast, machine-maker, for improvements in machinery for heckling or combing flax and other fibrous substances.
202. William Henry Moore, of Wenlock-place, City-road, cheesemonger, for improvements applicable to the construction of temporary dwellings.

The above bear date January 26th.

203. Charles Henry Alabaster, of Bethnal-green, hat-maker, for improvements in ploughs.
204. Alfred Barnes Sturdee, of Woolwich, naval architect, for a twin-stern ship or vessel with a protected propeller.
205. Edward Brown, of Sheffield, for improvements in the blades of table knives.
206. James Murdoch, of Staple-inn, for an improvement in stamping or shaping metals,—being a communication.
207. Edward Jones Biven, of Queen's-road, Bayswater, civil engineer, for improvements in the means of communicating signals on railways, and for other purposes.
208. William Galloway and John Galloway, of Manchester, engineers, for improvements in steam-engines and boilers.

The above bear date January 27th.

210. Robert Shaw, of Portlaw, cotton spinner, for starting, stopping, and reversing steam-engines.
211. James Learmont, of Edinburgh, for certain improvements in marine pumps, and apparatus connected therewith.
212. William Tranter, of Birmingham, gun-maker, for certain improvements in fire-arms.
213. Alfred Lucas, of St. George's, Middlesex, for an improved inkstand.
214. Louis Christian Koeffler, of Rochdale, bleacher and dyer, for improvements in bleaching and dyeing.

215. Joseph Scott, of Glasgow, glass manufacturer, for improvements in closing or stoppering bottles, jars, and other receptacles.
216. George Edmond Donisthorpe and John Crofts, of Leeds, for improvements in combing wool, hair, or other fibrous materials.
217. James Pole Kingston, of Lewisham-road, Kent, for improvements in combining metals for the bearings and packings of machinery.
218. Thomas Symes Prideaux, of Garden-road, St. John's-wood, for improvements in the manufacture of iron.
219. John Scott Russell, of Great George-street, for improvements in constructing ships and vessels propelled by screw or such like propeller.
220. Rowland Speed, of Wandsworth, butcher, for improvements in communicating between the guard and driver of a railway train, and in the apparatus employed therein.
221. Richard Archibald Brooman, of Fleet-street, for improvements in cables,—being a communication.

The above bear date January 28th.

222. Henry Avins and George Tarplee, both of Birmingham, for a new or improved brick.
223. Harold Potter, of Darwen, carpet manufacturer, for improvements in the mode or method of producing a certain color or colors on woven or textile fabrics and yarns, and in the machinery or apparatus connected therein.
224. John Standish, of Bolton, machine-maker, for improvements in machinery or apparatus used in the preparation of cotton, wool, flax, or other fibrous materials, to be spun.
225. William Archer, of Hampton Court, for an improved mode or modes of preventing accidents, by improved signals, on railways,—parts of which improvements are applicable to blast-furnaces.
226. Henry Moorhouse, of Denton, tailor, for improvements in the mode or method of preparing cotton, wool, flax, or other fibrous materials, and in the machinery or apparatus employed therein.
227. Francis Mackrory, of Vauxhall-bridge-road, for an invention to prevent all dust, blacks, and spray, entering the windows; also a preventive from noise caused by winds, called the *pulveris depulsor*, or newly-invented window.
229. Francis Whishaw, of John-street, Adelphi, civil engineer, for an improved lock or system of locks.
230. John Ryall Corry and James Barrett Corry, of Queen Camel, Somersetshire, leather dressers, for a new and improved method of dressing lambskin leather, and cleaning the wool therefrom.
231. Richard Archibald Brooman, of Fleet-street, for improvements in diving-bells, and apparatus to be used in connection therewith,—being a communication.

233. Marcus Spring, of Church-row, Hampstead, for improvement in apparatus for separating gold from matter mixed or combined therewith,—being a communication.
234. William Watson Hewitson, of Spring Field Mount, Leeds, for improvements in suspending or applying mariners' compasses in vessels built of iron or partly of iron.
235. Henry Batchelor, of Glasgow, engineer, for improvements in combining metal plates, for ship building and other engineering constructions.
236. James Shand, of Blackfriars-road, fire-engine manufacturer, for improvements in ships' fire-engines.
237. Samuel Rogerson, of Manchester, braid manufacturer, for certain improvements in the manufacture of braid, and in the machinery or apparatus connected therewith.
238. Lewis Jennings, of Fludyer-street, mechanical engineer, for an improved construction of lock.
239. William Constable, of Brighton, for improvements in transmitting motive power to machinery, and in regulating the action of rotary machines.
240. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in machinery for dressing cloth,—being a communication.
241. Jean Baptiste Lavanchy, of Tannige, Savoy, machinist, for improvements in the construction of collapsible frame-work of wood or iron, which may be employed for forming portable bedsteads, houses, parts of houses or bridges, and other similar structures, which may occasionally be required to be removed from place to place with facility, economy, and despatch.

The above bear date January 29th.

244. Thomas Knox, of Birmingham, shoe-maker, for a new or improved rotatory heel for boots and shoes.
245. Charles Caulfield, Rector of Creagh, Skibbereen, for propelling vessels through the water by means of tubular propellers, consisting of a tube or tubes, containing each a piston moved by steam or any other motive power.
246. Charles Cowper, of Southampton-buildings, for certain improvements in preserving butter and other substances,—being a communication.
247. Samuel Perkes, of Walbrook, City, civil engineer, for improvements in the mode of constructing certain works, applicable to aqueducts, viaducts, railways, canals, rivers, docks, harbours, lighthouses, breakwaters, reservoirs, tunnels, sea-walls, embankments, submarine foundations, and other useful purposes.
249. Thomas Moreton Jones, of Southampton-buildings, attorney, for an invention for checking or stopping railway trains of carriages, and steadying the carriages when in motion, and preventing jerking and collision of the carriages.

251. Louis Guillaume Perreaux, of Paris, engineer, for improvements in machinery or apparatus for testing and ascertaining the strength of yarn, thread, wire, strings, or fabrics.

252. Edwin Pugh, of Whitstable, draper, for improvements in the means of ballasting ships or vessels, and in rendering them buoyant under certain circumstances.

253. John Mason, of Rochdale, machine maker, for improvements in looms for weaving.

254. Thomas Lightfoot, of Accrington, for improvements in glazes for pottery or other similar materials.

255. Edmund Leach, of Rochdale, for improvements in the mode or method of preparing and spinning cotton, wool, flax, and other fibrous substances, and in the machinery or apparatus employed therein.

256. David Chalmers, of Manchester, manufacturer, for improvements in looms.

257. Israel P. Magoon, of Vermont, America, for a new and useful improvement in steam-boiler chimneys.

258. Frederick Lawrence, of Pitfield-street, William Davison, of Halstead, and Alfred Lawrence, of Pitfield-street, for improvements in engines to be worked by steam or other fluid.

259. William Pizzie, of Albourn, Wiltshire, for a railway-carriage-break.

260. Marc Louis Adam Tarin, of Mount-street, Grosvenor-square, for an improved dustpan.

261. Marc Louis Adam Tarin, of Mount-street, Grosvenor-square, for improvements in reflectors for diffusing light.

262. James Comins, of South Moulton, agricultural implement maker, for a clod crusher, land presser, or pulverizer.

263. Samuel Boreham, of Henry-street, Pentonville, clock maker, for certain improvements in time-keepers.

265. John Pinkerton, of High-street, Borough, for a new mode of applying and combining ornamented glass in the manufacture of useful and ornamental articles.

266. George Stretton, of Paddington, for a certain improvement in soap, hereby denominated "Amylon or starch soap."

267. Charles Hadley, of Lower Hurst-street, Birmingham, for improvements in the construction and formation of granite and stone pavements and surfaces for carriage and railways.

The above bear date January 31*st.*

269. Eliezer Edwards, of Birmingham, manufacturer, for a new or improved bedstead, which may be used as a vehicle.

270. Thomas Charles Clarkson, of High-street, Wapping, for improvements in giving elasticity to certain structures and parts thereof.

271. Edwin Whele, of Shiffnal, engineer, for improvements in candles and machinery or apparatus for making thereof.

272. Joshua Murgatroyd, of Heaton Norris, engineer, for im-

provements in the construction of boilers and apparatus connected therewith.

273. John Cockerill, of Kingston-upon-Hull, grocer, and Thomas Barnett, of the same town, miller, for improvements in the construction and use of coffee roasters.

274. Thomas Williams and James Plimpton, both of Middlesex, and Robertson Buchanan, of the City of London, for a method of actuating ships' pumps by the motion of the vessel at sea, which is also applicable to other purposes.

275. James Carter, of Oldham, painter, for an improved rotary engine.

276. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improvements in block printing machinery,—being a communication.

277. William Levesley, of Old Ford, cutler, for improvements in the construction of pencil-cases.

The above bear date February 1st.

278. William Gregory, of Vernon-place, Bloomsbury, for improvements in the manufacture of bricks and tiles,—being a communication.

279. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for a new and useful composition of matter, termed "metallic oil," to be used for lubricating the axles of wheels and the rubbing or working parts of steam-engines and every description of machinery and apparatus, for softening hemp and other fibrous substances preparatory to spinning the same, and for other purposes,—being a communication.

280. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in the manufacture of candles,—being a communication.

281. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in life-boats, and vessels of a similar nature,—being a communication.

282. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for a stoppering apparatus for bottles containing liquids of which small quantities are generally poured out at a time,—being a communication.

283. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in furnaces and apparatus combined therewith, for making wrought iron directly from the ore, and for collecting and condensing the oxides or other substances evaporated in the process of deoxidizing iron or other ores,—being a communication.

284. John Smeeton, of Limehouse, for improvements in the manufacture of dials, applicable to telegraphic instruments, chronometers, barometers, sextants, quadrants, compasses, clocks, watches, and other time-pieces.

285. John Verinder Kiddle, of Elder-street, Norton Folgate, for improvements in cocks or taps.

286. Owen Williams, of Stratford, for improvements in water-closets.
287. Ismael Isaac Abadie and Henri Lauret, of Paris, for an improved manufacture of parasols.
288. Richard Archibald Brooman, of Fleet-street, for improvements in expansion valves for steam-engines,—being a communication.
289. Thomas Paine, of Woolwich, for improvements in heels for boots, shoes, and other coverings for the feet.

The above bear date February 2nd.

290. Thomas Spiller and Anthony Crowhurst, of Red Lion-square, for an invention for propelling steam-vessels.
291. Manoah Bower, of Birmingham, for a new or improved apparatus to prevent the throwing up of mud by the wheels of vehicles.
293. To William Scarlett Wright, of Pont-street, Belgrave-square, for an improved bath.
294. George John Newbery, of East Greenwich, for improvements in hinges,—being a communication.
295. John Bower, of Dublin, for improvements in and applicable to certain descriptions of engines for driving piles.
296. Benoit Dulaurier, of Paris, for a new application of a system to render boots and shoes waterproof without sewing or nailing whatever; and the said invention to be applied also to render waterproof hats, caps, and general hatting; the invention consists also in the application of machines to the manufacturing of general shoe-making and hatting.
297. John Henry Johnson, of Lincoln's-inn-fields, for improvements in gas burners, and in regulating the combustion of gas,—being a communication.
298. James Greenhalgh, of Cheetham, for certain improvements in churns.
299. Alfred Tylor, of Warwick-lane, Newgate-street, and Henry George Frasi, of Herbert-street, New North-road, for improvements in water-closets.
300. William Richards, of Stourbridge, engineer, and Edwin Beck, of Cookley, iron-founder, for certain improvements in machinery for exhausting and driving atmospheric air.
301. John Crowther, of Huddersfield, and Joseph Alsop, of Huddersfield, for improvements in baking bread.

The above bear date February 3rd.

302. William Brown, of Birmingham, for an improvement or improvements in the construction of metallic bedsteads.
303. David Lloyd Price, of Beaufort, for improvements in signalling by electricity on railway trains and railways, and in the appliances used therein.
304. Frederick John Jones, of Addle-street, for improvements in fastenings for bands, belts, straps, and other similar articles,—being a communication.

305. Philip Webley, of Birmingham, for improvements in repeating pistols and other fire-arms.
306. George Winiwarter, of Red Lion-square, for certain improvements in the application of explosive compounds.
307. John Perkins, of Manchester, for improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom.
308. Robert Griffiths, of Great Ormond-street, for improvements in the manufacture of bolts and rivets.
309. John Dudgeon, of Cornhill, for improvements in machinery used for raising propellers.
310. Jacob Vale Asbury, of Enfield, for improvements in railway carriages.
311. William Edgar, of Giltspur-street, for an improved boot, particularly suitable for the use of emigrants and persons at sea.
312. George Letts, of Northampton, for improvements in machines for cutting and mincing meat and other materials for sausages and other like purposes, and for filling the prepared skins with the meat and other materials when so cut.
313. William Walker, of Manchester, for certain improvements in apparatus to be employed for the purposes of drying.
314. Alfred Woodward, of George-street, Edgbaston, for a double-action vertical lever churn.
315. Alfred Woodward, of George-street, Edgbaston, for a self-acting cam press.

The above bear date February 4th.

316. Richard Prosser, of Birmingham, for improvements in the construction of printing rollers used in machines for printing calicoes and other substances.
317. Thomas Peacock, of Ashton-under-Lyne, for certain improvements in weaving and in machinery for weaving hat plush and other cut piled fabrics.
318. George Hewitson, of Bradford, for improvements in machinery or apparatus for measuring or indicating the length of yarn as it is spun or wound on bobbins or rollers.
319. Antoine Wollowicz, of Paris, for improvements in primers for fire-arms.
320. John Whitehouse the elder, and John Whitehouse the younger, of Birmingham, for certain improvements in the manufacture of knobs for doors and other like uses; part of which improvements is applicable to the manufacture of certain articles of earthenware.
321. Charles Frederic Werckshagen, of Barmen, Prussia, for certain improvements in the manufacture of carbonate of soda and potash.
323. William Crossby, of Sheffield, for the consumption or burning of smoke.
324. John Campbell, of Bowfield, in the county of Renfrew, for improvements in the treatment or finishing of textile fabrics and materials.

325. Henry John Nicoll, of Regent-street, for improvements in garments for travelling.
326. Alexander Parkes, of Burry Port, Carmarthenshire, for improvements in the separation of certain metals from their ores or other compounds.
327. Edward Palmer, of Woodford Green, for improvements in carriages used on railways.
329. Joseph Cowan, of Liverpool, for improvements in propelling steam-vessels.

The above bear date February 5th.

330. William Romaine, of Sackville-street, Piccadilly, for improvements in rendering wood more durable and uninflammable.
331. William Scott, Robert Brough, James Rinoe, all of Brighton, and Thomas Mann, of Stroud, Rochester, for improvements in steam-engines.
332. John Londe Tabberner, of Lorn-road, North Brixton, for improvements in the mode of smelting iron and other ores, and in the manufacture of lime.
333. John Londe Tabberner, of Lorn-road, North Brixton, for improvements in the application of granite and similar substances to ornamenting purposes, and to the construction of buildings.
334. Richard Archibald Brooman, of Fleet-street, for improvements in sail hanks for securing stay-sail jibs and other sails to their proper stays,—being a communication.

The above bear date February 7th.

335. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in the treatment of bituminous and asphaltic matters, rendering them applicable to various useful purposes,—being a communication.
336. Thomas Howarth, of Rochdale, for a certain improved cement for closing steam or other joints.
337. John Buchanan, of Leamington, for an improved propeller, as to affixing the blades in the boss, and affixing the bosses to the spindle or centre shaft, and in the mode of placing it, and in controlling, lowering, and detaching the same.
338. Thomas Allan, of Adelphi-terrace, for improvements in protecting telegraph wires.
339. Thomas Allan, of Adelphi-terrace, for improvements in galvanic batteries.

The above bear date February 8th.

340. Thomas Reynolds, of Singleton-street, Hoxton, Henry Reynolds, of Hoxton, and Stephen Reynolds, of Charles-street, Westminster, for improvements in the means of retarding the progress of carriages.
341. Henry Pooley, of Liverpool, for improvements in weighing machines,—being partly a communication.
342. William Edward Newton, of the Office for Patents, Chan-

cery-lane, for improvements in machinery or apparatus for digging, excavating, or removing earth,—being a communication.

343. William Binks, of Timperly, and Samuel Bennett and Thomas Storey, both of Manchester, for certain improvements in pumps or apparatus for raising and forcing fluids.

344. John Little, of Glasgow, for improvements in lubricating mechanism.

345. William Birkett, of Manningham Mills, Bradford, for improvements in treating soap-suds or wash-waters in which soap has been used.

346. John Seaward, of Poplar, for improvements in marine engines.

347. Isaiah James Machin, of Leigh-street, for an improvement in nut-crackers.

348. Charles Iles, of Birmingham, for improvements in pointing wire.

349. John Webster, of Ipswich, for improvements in treating animal matters and in manufacturing manure.

The above bear date February 9th.

350. James Spotswood Wilson, of Tavistock-place, for improvements in the construction of furnaces or flues, whereby economy in the use of fuel, the consumption of smoke or gases, and the utilizing thereof are ensured.

351. William Joseph Curtis, of Birchin-lane, for an improvement in candlesticks.

352. Charles Cuylits, of Antwerp, for improvements in apparatus for regulating or governing the speed of steam or other engines,—being a communication.

354. John Hunter, of Glasgow, for improvements in the manufacture of textile fabrics.

355. William Fulton, of Paisley, for improvements in the treatment, cleansing, or finishing of textile fabrics.

356. James Anderson, of Auctnagie, Perth, for improvements in steam-engines.

357. William Ball, of Ilkeston, Derbyshire, for improvements in machinery for producing looped fabrics.

358. Henry McFarlane, of Lawrence-lane, for improvements in machinery for excavating,—being a communication.

359. Robert Ash, of High-street, Southwark, for improvements in stopping bottles and other vessels.

360. George Hutchinson, of Glasgow, for improvements in treating oils and other fatty matters.

361. Charles Breese, of Birmingham, for improvements in ornamenting papier-maché, japanned iron, china, and other hard or bright surfaces with gold.

363. William Potts, of Birmingham, for improvements in sepulchral and other commemorative monuments.

The above bear date February 10th.

List of Patents

Granted for SCOTLAND, from the 22nd January to the 22nd February, 1853.

James Timmings Chance, of Birmingham, for improvements in the manufacture of glass.—English patent, 1842.—Sealed 24th January.

James Timmings Chance, of Birmingham, for improvements in the manufacture of glass.—English patent, 1851.—Sealed 24th January.

Weston Tuxford, of Boston, Lincolnshire, for improvements in machinery for crushing or pressing land, and for shaking straw; also for improvements in applying steam power to agricultural machinery.—Sealed 24th January.

Julius Roberts, of Portsmouth, for improvements in the mariner's compass.—Sealed 24th January.

Douglas Hebson, of Dale-street, Liverpool, for improvements in steam-engines.—Sealed 24th January.

Marie Amadee, Charles Mellus, and Jean Theodore Coupier, of 16, Castle-street, Holborn, London, for improvements in the manufacture of paper.—Sealed 24th January.

Walter Ricardo, of the firm of A. & W. Ricardo, for improvements in gas-burners,—being a communication.—Sealed 25th January.

Henry Houldsworth, of Manchester, cotton spinner, for improvements in embroidering machines, and in apparatus used in connection therewith.—Sealed 31st January.

Henry Houldsworth and James Houldsworth, both of Manchester, silk manufacturers, for certain improvements in the fixing, extending, and holding of cloth to receive embroidery, and in apparatus applicable thereto.—Sealed 31st January.

Duncan Mackenzie, of Manchester, for certain improvements in machinery and apparatus for rendering in and transferring designs or patterns, and for cutting, punching, and numbering, or otherwise preparing perforated cards, papers, or other materials used or suitable in the manufacture of figured textile fabrics, by Jacquard or other weaving looms or frames.—Sealed 1st February.

Samuel Nichols, of Coldham-street, Nottingham, mechanic, and John Livesey, of New Lenton, and Edward Wroughton, of New Lenton, for improvements in the manufacture of textile fabrics, and in machinery for producing such fabrics.—Sealed 2nd February.

Thomas Carles, of Padstow, county of Cornwall, ship-builder, for improvements in propelling.—Sealed 2nd February.

James Lowe, of 9, Union-place, East Greenwich, London, mechanic, and Thomas Eyre Wyche, of 13, George-Street, Man-

sion-house, London, for improvements in propelling vessels.—Sealed 7th February.

Sir Thomas Livingstone Mitchell, Lieutenant-Colonel in the Army, for improvements in propelling vessels.—Sealed 7th February.

Edward Joseph Hughes, of Manchester, patent agent, for improvements in machinery or apparatus for spinning and weaving cotton, wool, and other fibrous substances; and also in machinery or apparatus for stitching, either plain or ornamental,—being a communication.—Sealed 9th February.

François Henri Bickes, of Mayence, for certain improvements in treating, manuring, or preparing corn, seeds, plants, and trees, and in fertilizing land.—Sealed 14th February.

George Henry Bachhoffner, of the Grove-road, St. John's Wood, London, and Nathan Defries, of Grafton-street, Fitzroy-square, London, for improvements in obtaining light and heat, and in apparatus connected therewith.—Sealed 14th February.

New Patents.

Sealed under old Law.

Pierre Isidor David, of Paris, machinist, for certain improvements in the method of bleaching, and in the apparatus connected therewith.—Sealed 5th February, 1853.

Mary Honiball, of St. John's Wood, executrix of the will of James Honiball, deceased,—an extension for six years from the 15th August, 1852, of letters patent, granted to William Henry Porter, for improvements in anchors; and which said letters patent were assigned by the said William Henry Porter to the said James Honiball.—Sealed 9th February, 1853.

Patents sealed under Patent Law Amendment Act, 1852.

10. Freeman Roe, of the Strand, for improvements in valves and cocks.—October 1.

62. John Sayers, of Prospect-place, Poplar, for improved arrangements for maintaining a level surface or level surfaces upon or in connection with bodies subject to a rocking motion.—October 1.

109. William Austin, of Birmingham, and William Sutherland, of the same place, for improvements in ornamenting glass.—October 1.

116. William Bolivar Davis, of Southampton, for improvements in ships' buoys, life buoys, ships' fenders, and other similar articles.—October 1.

155. David Stephens Brown, of Old Kent-road, for an improved means of navigating the water by ships.—October 2.
199. Edwin Bates, of Great Portland-street, for certain improvements for deriving motive power from expansive fluids, and the better application and economy thereof; for propelling ships and other vessels in sea, river, and canal navigation; also in the shape and action of wind-sails; the use of water as a motive power for driving machines, mills, &c.; the construction of turbines, air and water-pumps, marine-pumps, for emptying ships of bilge water, and other useful purposes.—October 4.
203. Robert Hazard, of Lincoln's-Inn-fields, for a calorific bath. —October 4.
233. William Crook, of Blackburn, for improvements in looms. —October 5.
253. Charles de Bergue, of Dowgate-hill, London, for certain improvements in machinery for punching metals, and for rivetting together metallic plates or bars.—October 6.
258. David Chalmers, of Manchester, for improvements in looms for weaving wire web or cloth by power.—October 6.
296. Alfred Trueman, of Swansea, for improvements in obtaining copper and other metals from ores, or matters containing them. —October 7.
317. William Scholfield and Joseph Pritchard, both of Oldham, for improvements in steam-boilers.—October 9.
330. Henry Moorhouse, of Denton, for improvements in machinery or apparatus for cleaning woollen, cotton, or linen rags and waste; which machinery or apparatus is applicable to cleaning and tempering clay, or other similar purposes.—October 11.
355. Peter Warren, of Stratmore-terrace, Shadwell, for an improved material, applicable to many purposes for which papier-maché and gutta-percha have been or may be used.—October 12
378. Preston Lumb, of Vauxhall, for improvements in apparatus for cleansing coal.—October 13.
384. Joseph Henry Tuck, of Pall-mall, for improvements in stuffing-boxes, and in packing to be used in stuffing-boxes, bearings, pistons, and valves.—October 14.
387. Joseph Major, of Elizabeth-place, Ball's Pond-road, for removing spavins, ringbones, curbs, splents, and other unnatural ossifications and humours from horses; which invention he names "Major's celebrated British remedy."—October 14.
403. Jeremiah Driver, of Keighley, and John Wells, of Bradford, for improvements in moulding in sand and loam, for the casting of iron and other metals.—October 15.
430. Richard Archibald Brooman, of Fleet-street, for improvements in vices.—October 18.
450. George Heyes, of Blackburn, for improvements in the manufacture of fancy woven or textile fabrics, and in the machinery or apparatus connected therewith.—October 20.

456. Anthony Liddell, of Canterbury, for improvements in stuffing-boxes, and in packing to be employed with stuffing-boxes and pistons.—October 20.

476. Samuel Marsh, of Mansfield, for improvements in the manufacture of woven fabrics by means of lace machinery.—October 21.

500. Arnold James Cooley, of Parliament-street, for improvements in the manufacture of artificial leather.—October 23.

519. Mathew Fitzpatrick, of Upper Cleveland-street, Fitzroy-square, for certain improvements in machinery or apparatus to be applied to locomotive engines and carriages for the prevention of accidents; and also in the manufacture and application of indestructible and non-rebounding cushions, to be applied to the above, and for other similar purposes.—October 25.

525. Myer Myers, Maurice Myers, and William Hill, all of Birmingham, for certain improvements in pens and penholders.—October 26.

560. Arthur Ashpitel and John Whichcord the younger, both of Carlton Chambers, Regent-street, for certain improvements in cocks, valves, and fire-plugs.—October 29.

576. Bowman Fleming McCallum, of Glasgow, for a yarn-drying machine.—October 30.

585. John Whitcomb and Richard Smith, both of Kidderminster, for improvements in the manufacture of carpets, hearth-rugs, and other similar fabrics.—October 30.

587. James Rock, of Hastings, for improvements in railway carriages,—October 30.

611. Robert William Sievier, of Holloway, for improvements applicable to the manufacture of hats, caps, and bonnets, or other coverings for the head.—November 2.

625. John Cameron, of Manchester, for improvements in boilers for generating steam, and in feed pumps and apparatus connected therewith.—November 3,

650. James Wotherspoon, of Glasgow, for improvements in the manufacture or production of confectionery, and in the machinery, apparatus, or means employed therein.—November 5.

684. Thomas Dunn, of Pendleton, and William Watts, junior, of Miles Platting, for improvements in the construction of railways. —November 9.

698. Oswald Dodd Hedley, of Newcastle-upon-Tyne, for improvements in getting coals and other minerals.—November 9.

716. Richard Barnes, of Wigan, for improvements in cocks or plugs for water or other fluids.—November 11.

721. Caleb Bloomer, of West Bromwich, for improvements in the manufacture of anchors.—November 12.

753. Robert Sandiford, of Tottington Lower End, near Bury, for certain improvements in apparatus for block printing.—November 15.

757. Thomas Taylor, of Manchester, for improvements in apparatus for measuring water and other fluids; which apparatus is

also applicable to the purpose of obtaining motive power.—November 15.

758. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in knitting machinery,—being a communication.—November 15.

761. Samuel Holt, of Stockport, for improvements in weaving cut piled fabrics.—November 15.

762. Joseph Burley, of Halifax, mechanic, for improvements in apparatus for cutting fustians and other fabrics, to obtain a cut pile surface.—November 15.

766. William Marsden, of Blackburn, for certain improvements in and applicable to looms for weaving.—November 16.

767. John Ramsbottom, of Longsight, near Manchester, for certain improvements in steam-engines.—November 16.

771. John Thomas Way, of Holles-street, and John Manwaring Paine, of Farnham, for improvements in the manufacture of burned and fired ware.—November 17.

772. Isaac Lowthian Bell, of the Washington Chemical Works, Newcastle-upon-Tyne, for improvements in the treatment of certain compounds of iron and sulphur.—November 17.

774. John Hinchcliff, of Leeds, and Ralph Salt, of Leeds, for improvements in steam-engines.—November 17.

776. Francis Bresson, of Paris, civil engineer, for a new and improved mode of propelling on land and water.—November 17.

778. Henry Vernon Physick, of Aberdeen-place, Maida-hill, for improvements in electric telegraphic apparatus, and in machinery or apparatus for constructing the same.—November 17.

782. John Venables Vernon, and John Edge, both of Manchester, for improvements in apparatus and machinery for engraving rollers of glass, copper, brass, and other metallic compounds.—November 19.

785. Peter Carmichael, of Den's Works, Dundee, for improvements in machinery for winding yarn or thread.—November 19.

786. John Burgess, of Rastrick, dyer, for an improvement in dyeing wool.—November 19.

787. Moses Poole, of Serle-street, for improvements in the manufacture of seamless garments and other seamless fabrics,—being a communication.—November 19.

788. William Williams, of Birmingham, for improvements in electric telegraphs.—November 19.

789. George Perry Tewksbury, of Boston, America, for an improved life-preserving seat.—November 19.

790. Benjamin Nickels, of Albany-road, for improvements in the manufacture of adhesive plaster.—November 19.

791. Richard Kemsley Day, of Plaistow, for improvements in the manufacture of fuel for lighting fires.—November 19.

794. Moses Poole, of Serle-street, for improvements in cementing matters in the production of ornamental and other forms and surfaces,—being a communication.—November 19.

798. Jean Joseph Jules Pierrard, of Paris, for improvements in preparing wool and other fibrous substances for combing.—November 19.

800. Richard Taylor, of Clayton-Bridge, Newton-heath, for certain improvements in heating dye cisterns and soap cisterns, used in the process of calico printing.—November 20.

802. John Brettell Collins, of Birmingham, factor, for a new improved flooring cramp or lifting jack.—November 20.

808. George Wilson, of York, for an improved manufacture of glass bottles and jars.—November 20.

812. William Crosskill, of Beverley, iron-founder, for improvements in clod crushers, or rollers for rolling, crushing, or pressing land.—November 22.

817. John Pepper, junior, of Portsmouth, America, for a new or improved machine for knitting ribbed work.—November 22.

818. William Hedges, of Streatham-hill, for improvements in carriages.—November 22.

820. Samuel Hunter, of Ravensworth-terrace, Gateshead, for improvements in anchors.—November 22.

824. John Winter, of Bradford, engineer, for improvements in the mode of combining bars of iron so as to form larger masses or pieces of iron, applicable in the manufacture of axles, shafts, columns, beams, cannon, and other articles.—November 23.

825. John Winter, of Bradford, engineer, for improvements in the manufacture of wheels.—November 23.

826. Francis Bywater Frith, of Salford, for certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, cords, beaverteens, and other similar fabrics, composed of cotton, silk, wool, and other fibrous materials.—November 23.

827. John Kilner, of Thornhill-lees, near Dewsbury, glass bottle manufacturer, for certain improvements in the means of insulating the wires of electric telegraphs.—November 23.

833. John Frearson, of Birmingham, for improvements in the manufacture of hooks for garments.—November 23.

834. Charles Watt, of Brompton, for improvements in obtaining currents of electricity.—November 23.

839. James Higgin, of Manchester, for improvements in the manufacture of certain mordants, used in preparing woven or textile fabrics for printing, staining, or dyeing them; and in the mode or method of using the same or other mordants for the said purposes.—November 24.

850. William Henry Winchester, of Tamerton Foliott, for improvements in splints.—November 24.

851. William Wilkinson, of Nottingham, for improvements in the manufacture of looped and textile fabrics, and in machinery for producing the same.—November 24.

854. Edward Aitchison, of Manor-street, Chelsea, and John Evans, of Hamilton-street, Wandsworth-road, boiler maker, for improvements in furnaces.—November 24.

856. Richard Dudgeon, of New York, machinist, for an invention for raising heavy weights, by means of a portable hydraulic press.—November 25.

857. John Gedge, of Wellington-street, for improvements in the mechanism of looms for weaving,—being a communication.—November 26.

862. Andrew Jeffrey, of Chirnside, blacksmith, for improvements in reaping machines.—November 25.

863. Henry Holland, of Birmingham, for improvements in the manufacture of umbrellas and parasols.—November 25.

865. Charles Harford, of Down Place, near Windsor, for improvements in rotary engines.—November 25.

867. Charles Iles, of Birmingham, for improvements in the manufacture of chimney-pieces.—November 25.

871. James Taylor, of Britannia Works, Birkenhead, for certain improvements in and applicable to floating graving docks for repairing and building ships.—November 26.

877. Thomas Ainsley Cook, of Wall's End, for improvements in bleaching.—November 26.

880. Alexander Turiff, of Paisley, for improvements in moulding or shaping metals.—November 26.

881. Henry Bollman Condy, of Battersea, for improvements in the manufacture of acetic acid and acetates.—November 26.

883. William Massingham, of Ipswich, for improvements in carriages and apparatus for carrying the dead.—November 26.

886. Edwin Lewis Brundage, of Jewin-crescent, for improvements in apparatus for drawing off fluids from animal bodies,—being a communication.—November 26.

894. William Joseph Curtis, of Grafton-place, Euston-square, for certain improvements in the formation of tramroads or railroads, and carriages that run thereon.—November 27.

895. Emile Martin, of Paris, for certain improvements in the mode of extracting gluten from wheat, and for preparing and drying the same by mixing to several degrees of concentration.—November 27.

897. George Houghton, of Birmingham, for improvements in the manufacture of college caps.—November 27.

898. William Edward Schottlander, of Southwark, for improvements in machinery for boring the ground, stone, or rocks, for the formation of drains and sewers, for the laying of pipes underground, and for removing obstructions therein; also in the manufacture of pipes to be used in connection with such machinery; and in instruments for surveying and levelling

preparatory to the boring operations,—being a communication. —November 27.

900. Samuel Cunliffe Lister, of Manningham, and James Warburton, of Addingham, for improvements in the manufacture of yarn from fibrous materials.—November 29.

903. William Pink, of Fareham, for an improved construction of stirrup-bar for saddles.—November 29.

907. Jean David Schneiter, of Paris, for improvements in maps and charts.—November 29.

913. James Murdoch, of Staple Inn, for certain improved materials for use in painting,—a communication.—November 30.

915. Samuel Clark, of Albany-street, Regent's-park, for improvements in lamps.—November 30.

918. Joseph Skertchley, jun., of Anstey, near Leicester, for improvements in mangles and mangle-rollers.—November 30.

927. Robert Milligan, of Harden Mills, Bingley, for improvements applicable to combing machinery.—December 1.

932. William Taylor, of Oxford-terrace, Hyde Park, for improvements in propelling ships and other floating bodies.—December 2.

933. James Rothwell, of Heywood, for certain improvements in looms for weaving.—December 2.

935. James Edward Mc Connell, of Wolverton, for improvements in locomotive engines. December 2.

938. Charles Millar, of Dundee, brewer, for improvements in time-keepers or clock-work, and in machinery or apparatus worked in connexion therewith.—December 2.

939. James Newall, of Bury, for improvements in breaks, machinery, or apparatus applied to railway and other carriages in motion, and in the mode or method of connecting two or more of such breaks together.—December 3.

944. Page Dewing Woodcock, of Lincoln, for an improved preparation or pill for medicinal purposes, hereby denominated "Page Woodcock's wind pills."—December 3.

951. Arthur Wall, of East India-road, for improvements in preparing sheet metal for ship-building and other uses.—Dec. 3.

952. Duncan Mc Nee, of Kirkintulloch, for a machine for printing with colors on cloth, and which is also applicable for printing ornamental designs on paper.—December 3.

959. James Murdoch, of Staple Inn, for an improved galvanic battery,—being a communication.—December 4.

962. William Maugham, of Ifield-terrace, in the county of Surrey, for improvements in rendering wood fire-proof.—December 4.

970. Asa Lees, of Rhodes-house, Oldham, and Thomas Kay, of Mumps, Oldham, for improvements in machinery for spinning and doubling cotton, wool, silk, flax, and other fibrous materials.—December 6.

971. Frederick Mackellar Gooch, of Bolton le-Moors, for improvements in the construction of railway signals, and in machinery or apparatus for working railway signals.—December 6.

978. James Smith, of Little Canterbury-place, Lambeth, for improvements in paving roads and other surfaces.—December 6.

985. William Mayo, of Berners-street, for improvements in balls or float-valves and cocks.—December 7.

991. Thomas Lovell Preston, of Birmingham, for a machine for making links for chains.—December 8.

994. Henry Jenkins, of Birmingham, for improvements in the manufacture of bracelets, brooches, and other articles of jewellery.—December 8.

1000. James Lawrence, of Westminster, for improvements in the manufacture of projectiles.—December 8.

1001. Anthony Norris Groves, of Madras, and Conrad William Finzel, jun., of Bristol, for improvements in condensing steam or vapours.—December 8.

1003. Sir John Powlett Orde, of Kilmorey House, Loch Gilp Head, for improvements in head gear for horses and other like animals.—December 8.

1005. Emile Kopp, of Accrington, and Frederick Albert Gatty, of Accrington, for improvements in printing or dyeing textile fabrics.—December 9.

1011. Edward Thomas Loseby, of Gerrard-street, Islington, for improvements in the construction of time-keepers, and in cases to be applied thereto.—December 9.

1012. Charles Greenway, of Cheltenham, for improvements in anchors.—December 9.

1013. George Collier, of Halifax, for improvements in the manufacture of carpets and other fabrics.—December 9.

1022. Thomas Boardman, of Pendleton, for improvements in looms for weaving.—December 11.

1031. George Dixon, of Birmingham, for improvements in the manufacture and refining of sugar,—being a communication.—December 11.

1032. Timothy Morris, of Birmingham, and William Johnson, of Washwood Heath, near Birmingham, for improvements in depositing alloys of metals.—December 11.

1034. John Thomas Way, of Holles-street, Cavendish-square, and John Manwaring Paine, of Farnham, for improvements in the manufacture of glass.—December 11.

1036. Josiah Glasson, of Soho Foundry, near Birmingham, for improvements in boilers.—December 13.

1044. David Napier, of Millwall, for improvements in steam-engines.—December 13.

1045. Henry Clayton, of Upper Park-place, Dorset-square, for improvements in the manufacture of bricks.—December 13.

1046. William Henry Fox Talbot, of Lacock Abbey, for improvements in obtaining motive power.—December 13.

1051. John Webb, of Coventry, for improvements in ornamenting enamel watch dials.—December 14.

1058. Rudolph Appel, of Gerrard-street, Soho, for improvements in anastatic printing, and in producing copies of drawings, writings, and printed impressions.—December 14.

1063. George Elliot and William Russell, both of Saint Helen's, for certain improvements in boiling down saline solutions.—December 15.

1068. Anthony Norris Groves, of Bristol, for improvements in apparatus for heating, drying, and evaporating.—December 15.

1069. Richard Taylor, jun., of Queen-street, Cheapside, and John Arthur Phillips, of Upper Stamford-street, Blackfriars, for improvements in treating zinc ores.—December 15.

1070. Clement Dresser, of Basinghall-street, for improvements in combining materials to be used in substitution of whalebone and other flexible and elastic substances,—being a communication.—December 15.

1071. Thomas Dunn, of Pendleton, Hugh Greaves, of Manchester, and William Watts, jun., of Miles Platting, for improvements in machinery and apparatus for altering the position of engines and carriages on railways.—December 15.

1087. George Sands Sidney, of Brixton-road, for improvements in jugs or vessels for containing liquids.—December 16.

1093. William Wilkinson, of Nottingham, for improvements in the manufacture of looped-pile and cut-pile fabrics, and the machinery employed therein.—December 17.

1094. Alfred Krupp, of Essen, Prussia, for improvements in cannons.—December 17.

1096. James Langridge, of Bristol, for improvements in the manufacture of stays.—December 17.

1097. Joseph Matthews, of Strickland-gate, Kendal, for a burglary alarm.—December 18.

1100. William Robertson, of Barrhead, for improvements in certain machines for spinning and doubling cotton and other fibrous substances.—December 18.

1107. William East, of Spalding, for improvements in machinery for crushing clods, for dibbling and drilling land, and sowing seeds.—December 18.

1108. Juan Nepomuceno Adorno, of Golden-square, for improvements in the manufacture of cigars, cigarettes, and other similar articles.—December 20.

1115. William John Silver, of Clark-street, Stepney, for improvements in giving motion to capstan and other barrels.—December 20.

1116. George Gwynne, of Hyde-park-square, and George Ferguson Wilson, of Belmont, Vauxhall, for improvements in the manufacture of candles, night-lights, and soap.—December 20.

1123. Warren De la Rue, of Bunhill-row, for improvements in preparing the surfaces of paper and card-board.—December 21.

1128. Ephraim Mosely, of Grosvenor-street, for improvements in the manufacture of artificial masticating apparatus.—Dec. 21.

1132. Frank Clarke Hills, of Deptford, for improvements in purifying gas.—December 22.

1136. Thomas Greenshields, of Stoke Works, Worcestershire, for improvements in the manufacture of alkali.—December 22.

1149. Jean Louis David, of Paris, for certain improvements in the manufacture of woollen fabrics.—December 23.

1150. Peter Fairbairn, of Leeds, and Samuel Renny Mathers, of the same place, for certain improvements in machinery for carding flax, hemp, china-grass, and jute, and the tow of the several materials before mentioned.—December 23.

1152. Fulcran Peyre and Michel Dolques, of Lodéve, France, for improvements in machinery for dressing woollen cloth.—December 24.

1161. George Bower, of St. Neot's, for improvements in the manufacture of gas for illumination.—December 24.

1168. George Ingham, of Rochdale, for certain improvements in machinery for drawing cotton and other fibrous materials.—December 24.

1171. George Gwynne, of Hyde-park-square, and George Ferguson Wilson, of Belmont, Vauxhall, for improvements in treating fatty and oily matters.—December 27.

1183. Claude Joseph Edmée Junot, of Rue Basse Passy, France, for improvements in the mode of reducing several metallic substances, hitherto unused, and applying them, so prepared, to the plating of other metals and substances, by means of electricity,—being a communication.—December 28.

1184. Samuel Clegg, of Regent's-square, for improvements in apparatus for measuring gas.—December 28.

1185. Francis Alton Calvert, of Manchester, for a universal ratchet-drill,—being a communication.—December 28.

1188. John Whichcord the younger, and Samuel Egan Rosser, of Great Russell-street, for certain improvements in the mode of burning and applying gas for light and heat.—December 29.

1203. Robert Stephen Oliver, of Edinburgh, for certain improvements in waterproof and other garments.—December 30.

CELESTIAL PHENOMENA FOR MARCH, 1853.

D.	H.	M.	
1			Clock before the ☉ 12m. 34s.
—			☽ rises Morn.
—			☽ passes mer. 4h. 48m. M.
—			☽ sets 9h. 27m. M.
—			Occul. ω Ophiuchi, im. 17h. 37m. em. 18h. 34m.
2	1	40	☽ in □ or last quarter
	5	31	♃'s first sat. will im.
	19	26	♃ in conj. with the ☽ diff. of dec. 0. 19. N.
	—		Occul. c^2 Ophiuchi, im. 17h. 4m. em. 18h. 11m.
5			Clock before the ☉ 11m. 42s.
—			☽ rises 4h. 49m. M.
—			☽ pass mer. 8h. 37m. M.
—			☽ sets 0h. 27m. A.
6			Vesta in Aphelion
7	19	9	♀ in conj. with the ☽ diff. of dec. 3. 33. N.
8	10	47	♂ in conj. with the ☽ diff. of dec. 4. 1. N.
9	4	48	Pallas stationary
	8	19	Ecliptic conj. or ● new moon
		21	♂ in Perihelion
	10	58	♀ in Aphelion
10			Clock before the ☉ 10m. 28s.
—			☽ rises 7h. 13m. M.
—			☽ pass mer. 0h. 48m. A.
—			☽ sets 6h. 34m. A.
	3	36	☿ in conj. with the ☽ diff. of dec. 5. 10. N.
11	4	13	Juno in conj. with ♄ diff. of dec. 8. 26. S.
	9	10	☿ in the ascending node
12			Ceres stationary
13	1	9	♅ in conj. with the ☽ diff. of dec. 3. 34. N.
	10	7	♃ in □ with the ☉
	19	37	♄ in conj. with the ☽ diff. of dec. 1. 12. N.
14	17	0	☽ in Apogee
15			Clock before the ☉ 9m. 6s.

D.	H.	M.	
15			☽ rises 3h. 38m. M.
	—		☽ pass mer. 4h. 20m. A.
	—		☽ sets Morn.
	22	51	☿ in Perihelion
17	8	54	♃'s second sat. will im.
	11	34	☽ in □ or first quarter
18	3	47	♃'s first sat. will im.
20			Clock before the ☉ 7m. 37s.
	—		☽ rises 0h. 6m. A.
	—		☽ pass mer. 8h. 32m. A.
	—		☽ sets 4h. 8m. M.
	4	25	☉ enters Aries,—Spring com.
23	5	51	☿ greatest elong. 18. 35. E.
24	2	44	♃'s third sat. will im.
	5	4	♃'s third sat. will em.
25			Clock before the ☉ 6m. 5s.
	—		☽ rises 6h. 47m. A.
	—		☽ pass mer. 0h. 1m.
	—		☽ sets 6h. 25m. M.
	5	40	♃'s first sat. will im.
	6	20	Ecliptic oppo. or ○ full moon
	7	7	♀ in conj. with ♂ diff. of dec. 0. 30. S.
25	6	55	☿ greatest hel. lat. N.
	—		Occul 95, Virginis, im. 11h. 0m. em. 12h. 6m.
	—		Occul. κ Virginis, im. 14h. 42m. em. 15h. 50m.
	14	0	☽ in Perigee
28			Occul. ξ^1 Scorpii, im. 12h. 34m. em. 13h. 39m.
30			Clock before the ☉ 4m. 32s.
	—		☽ rises 0h. 30m. M.
	—		☽ pass mer. 4h. 34m. M.
	—		☽ sets 8h. 33m. M.
	4	46	♃ in conj. with the ☽ diff. of dec. 0. 46. N.
31	9	42	☽ in □ or last quarter.
	10	29	☿ stationary
	—		Occul. x Sagittarii, im. 15h. 32m. em. 16h. 43m.

J. LEWTHWAITE Rotherhithe.

THE

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No. CCLVI.

RECENT PATENTS.

To John Robinson, *of Rochdale, in the county of Lancaster, timber merchant, for improvements in machinery or apparatus for shaping wood into mouldings and other forms.*—[Sealed 29th April, 1852.]

These improvements relate to certain machinery or apparatus for cutting wood into mouldings and other such forms by the action of rotatory cutters;—the particular points of novelty consisting, firstly, in a method of fixing the cutters to the parts which hold them; secondly, in a method of mounting the axles of such cutters; and, thirdly, in an arrangement for shortening the length of the cutters employed for carving the thinner or deeper parts of the moulding.

The cutters are secured by means of bolts, having wedge-formed heads, projecting into grooves formed within the holders, and in which they are capable of being moved crosswise, so as to adjust them to any required pattern. The axles of the cutter-holders are formed conical at their extremities,—such conical parts fitting into brasses of a corresponding shape, capable of being adjusted, so as to compensate for any wear and consequent looseness. According to the third part of this invention, the table, for supporting the material to be operated upon, is mounted in the machine, so as to be capable of being turned upon a centre; by which means its surface may be made to assume any required angle to the horizontal line; and, by this arrangement, the operator is enabled to adjust a wedge-formed piece of wood, intended to form a moulding, so that its transverse surface shall be equidistant

or nearly so from the axis of the cutters,—thereby avoiding the necessity of using cutters of extended length for the thinner portion of the moulding. Thus, supposing it be desired to operate upon a wedge-formed piece of wood, so as to cut the moulding represented at fig. 1, in Plate VIII., and that the line A, B, indicates the position of the axis of the cutters,—the strip of wood resting upon a horizontal table C, D,—the instrument employed for carving the portion E, will be represented by the length E, F, and that for operating upon G, by G, H. But if the table be shifted, so as to occupy a position in relation to the axis A, B, as represented at fig. 2, then the lines E, F, G, H, which represent the lengths of the cutters, will be equal, or nearer so than in fig. 1, and a greater steadiness of action will be produced. The same effect may be obtained by placing the wood as in fig. 1, but upon a fixed table, and making the axis of the cutters moveable, so as to be capable of bringing the parts into the relative positions shewn at fig. 2.

The above improvements are shewn embodied in a machine at figs. 3, 4, and 5;—fig. 3, being a longitudinal section, fig. 4, a transverse vertical section, and fig. 5, a plan view thereof. *a*, is the framework of the machine, at the ends of which there are upright shafts *b*, turning in steps *c*, at their lower ends, and furnished with screws at top, taking into screw-boxes *d*, which are situate within sliding-pieces *e*. These pieces *e*, move vertically against the stationary framework of the machine, and are capable of being raised or lowered by turning the shafts *b*, in their screw-boxes, and of being confined to any required elevation by means of bolts *f*. The lower ends of the pieces *e*, are provided with circular flanges, projecting inwards, upon which are placed other circular flanges *g*, formed upon the table *h*. The table-flanges *g*, have slots formed through them; and in these slots are placed bolts *i*, which also project through holes formed in the flanges of the pieces *e*. By this arrangement, the table *h*, on which the material to be operated upon is placed, can be raised or lowered to suit the thickness of wood to be cut by means of the shafts *b*; and it can also be caused to assume an angle to the horizontal line, by turning its circular flanges within those of the pieces *e*; and during the operation of the machine it will be kept in this position by the bolts *f*, and *i*.

The cutters are shewn mounted in their holders at I, J, K, L, suitably situated for cutting both sides and the top and bottom of the moulding. The manner in which the cutters are mounted will be seen by inspecting fig. 6, and also the general

views before referred to,—the former being a detached view of one of the holders. It consists of a metal block *j*, having dovetailed grooves *k*, formed in the direction of its length; at one end of these grooves there is an enlarged part *l*, within which the dovetailed heads of the bolts *m*, are placed; these bolts are then slipped into the narrower part of the groove, and the cutters placed on them; after which, plates *n*, are applied, and the whole secured in the desired position by nuts. The number of cutters thus applied, and their width, will depend upon the moulding to be cut: one only may be used for the sides and bottom, and, in some cases, for the pattern; or several may be adapted side by side, making up together the whole of the design to be produced. The method of mounting the axes of the cutters will be best seen by reference to fig. 7, which is a detached sectional view of one of those employed for operating upon one side of the moulding. The spindles *o*, are formed conical at their ends, which are placed in brasses *p*, capable of being moved in sockets formed within a bracket *q*, and of being retained in a desired position therein by set-screws *r*. The brasses *p*, are formed hollow, and screwed on their inner surfaces to receive set-screws *s*, which can be caused to bear against the ends of the spindles *o*. The bracket *q*, is mounted upon a V-shaped piece *t*, attached to a flange formed upon the table *h*, and is capable of being slidden thereon, so as to be brought nearer to or further from the edge of the wood to be cut, and retained in that position by screws *u*; and as the bracket *q*, is attached to the table *h*, the cutting apparatus will move therewith, and therefore maintain the same relative position. The spindle of the cutter or cutters which operate upon the bottom of the material is similarly mounted in conical centres *p*, carried by sockets affixed to brackets *v*, pendant from the table *h*; so that to whatever angle the table may be turned, this cutting apparatus will also move with it, and always maintain the same relative position thereto. The spindle for carrying the top cutters also turns in similar centres; but the sockets of this (seen at *w*,) are mounted upon the stationary framework *a*, of the machine, and are therefore independent of the motion of the table *h*. It will be perceived that there are four cutter-grooves formed within the blocks *j*; and the knives may be distributed amongst them in any desired manner, so as to make up the whole of the pattern to be cut: for instance, if the design required eight cutters, four may be placed at *x*, and the others as at *y*; but, in such cases, it is preferred to balance the

blocks by placing other instruments, as at *z*,—not however of sufficient length to arrive in contact with the material.

Upon the stationary framework are fixed a series of standards 1, within which are mounted shafts 2, provided with saw-edged rollers 3. To the tops of the standards 1, are attached bridge-pieces 4, through which pass screws 5, connected at their lower ends by swivel-joints to other bridge-pieces 6, the lower ends whereof rest upon the brasses in which the shafts 2, revolve. By the screws 5, therefore, the pieces 6, and consequently the brasses on which they rest, are forced down, carrying with them the saw-edged rollers 3, so as to press them into the material M, to be cut; and, by the rotation of such saw-edged rollers, the material M, will be impelled through the machine. At one end of the machine is mounted a horizontal shaft 7, capable of turning in bearings 8; which shaft carries an arm 9, provided with a block 10; and it is also furnished with a lever 11, bearing at its outward end a weight 12; so that the block 10, is thus pressed downward, and, bearing against the wood in progress of being cut, keeps it in contact with the table *h*. The parallel motion of the wood M, is assisted by means of a guide-piece 13, (secured by adjusting-screws to the table), against which it is pressed by a spring 14.

In the foregoing description, the patentee has pointed out a certain arrangement of machinery by which his invention may be carried into practical operation; he does not however confine himself thereto; as the points of novelty admit of other methods of application. He particularly remarks, that, instead of causing the table to move so as to bring the upper surface of the wood parallel to the axis of the top cutters, the spindle of those instruments may be mounted in guides, so as to be capable of being moved from the horizontal line—thus accomplishing the same object. He also observes, that it does not of necessity follow that the upper surface of the wood to be cut, and the spindle of the cutters, should be brought parallel to each other; for an approximation thereto may sometimes answer, or be preferable. The machine has been described as cutting mouldings upon wedge-formed strips of wood; but strips of a rectangular form may of course in like manner be operated upon; and in such cases it may at times be desirable to raise one side thereof, so as to be nearer to the axis of the cutters than the other side, in order that a greater depth may be removed by cutters of similar lengths.

The patentee claims, Firstly,—the method of attaching the cutters to their blocks or holders. Secondly,—the use of

conical centres as bearings for the cutter-spindles to run in. Thirdly,—the employment of apparatus suitably constructed and arranged for causing the surface upon which the moulding is to be formed, and the axis upon which the cutters revolve, to assume different angles to each other at pleasure.—[*Inrolled October*, 1852.]

To Alfred Vincent Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in machinery for cutting soap into slabs, bars, or cakes,—being a communication.*—[Sealed 10th July, 1852.]

This invention of improvements in machinery for cutting soap into slabs, bars, or cakes, consists in the employment of a series of wires, under tension, and placed at the required distance apart to suit the thickness of slabs or bars of soap to be produced; when this is combined with a carriage composed of slots, or so slotted along its length, that the wires shall pass through and permit the carriage to move from end to end of its reciprocating motion without affecting the relative positions of the several wires, and thus force the soap against the said wires, in order to cut it into slabs or bars. And the invention also consists in keeping the wires, in such a machine, at the required tension, by means of weights or springs, so that they may yield without breaking when exposed to undue strain.

In Plate VII., fig. 1, is a perspective view, and fig. 2, a transverse vertical section of a machine for cutting soap into slabs. *a*, represents a suitable frame, with two parallel ways *b, b*, to which a carriage *c*, is fitted and slides thereon. Each side-piece of the carriage is composed of two parts, with a space *d*, between them; in which are fitted the end tenons of a series of bars *e*; so that the said bars can be shifted at pleasure, and placed nearer together or farther apart, to suit the thickness of the intended slabs of soap to be produced; and the bars are secured in their places, when properly adjusted, by means of wedge-keys *f*. To the top of the carriage, and near one end of it, is hinged a support-frame *g*; the upper rail of which is notched at its front edge, as shewn at *h*; and to its back edge is hinged a brace *i*, to hold the frame in place when the machine is in operation. The bottom of the carriage is provided with a rack *j*, the cogs whereof are engaged by a pinion *k*, on a horizontal shaft *l*, receiving mo-

tion by a train of wheels *m, n, o,* from a crank-handle *p,* or from any other suitable contrivance. Just below the carriage there is a cross-rod *q;* to which are attached the lower ends of a series of wires *r,* that pass up through the spaces between the bars *e,* thence through holes in a plate *s,* and over a series of rollers or wheels *t,* arranged side by side on a rod near the top of the frame. To the end of each of the wires a weight is suspended, to keep them at the required tension. The plate *s,* is pierced with a row of holes to receive the wires, and to admit of their lateral adjustment to suit the work which the machine is required to perform. A short distance above the top surface of the carriage there is another wire *u,* stretched across horizontally, with one end attached to one of the standards of the frame, and the other passing through a hole in the other standard, thence over a pulley *v,* and having a tension-weight *w,* attached to it.

A large block of soap is placed on the carriage, with one end against the support-frame *g;* and the carriage being then set in motion, the soap is forced against the wires, by which it is severed into slabs, equal in thickness to the spaces between the wires. When the forward motion of the carriage is completed, the wires will have passed through the end of the block of soap into the grooves or spaces in the front face of the top bar of the supporting frame. The horizontal wire *u,* as the carriage progresses, removes the lower part of the block of soap, so as to leave the under surface of the lower slab smooth. At the end of the operation, the slabs are removed, the carriage run back, and the machine is in readiness to receive another block of soap.

If, in the cutting operation, the power applied should bring too great a strain on the wires—or if there should be in the block of soap any hard substance which the wires or any one of them cannot cut through—such wire or wires, so impeded, will be permitted by the weights to give way; and thus the breaking of the cutting-wires will be avoided.

After a block of soap has thus been cut into slabs, the slabs can be laid flatwise on the carriage and cut into bars; or a series of slabs can be laid at once on the carriage, and, at one operation, cut into bars. It is, however, preferred to perform this second operation on a separate machine, such as represented, in longitudinal section, at fig. 3, where it will be seen that the carriage is formed with one double end-piece *y,* having parallel bars *e,* inserted into it and projecting out,—each bar having a shoulder *x,* on its top surface, against which the slabs are placed. It is not necessary, in cutting a slab

into bars, to resort to the precaution of providing the wires with tension-weights, as the liability to their breaking, under operation, is very remote. This machine, like the preceding, should be provided with rack and wheel-work for applying the motive power. It will be obvious, that bars of soap can be cut into square cakes by the same mode of operation.

The patentee does not limit himself to the precise mode of construction above specified, so long as the same result is produced by analogous means. He claims, First,—the employment of a series of wires, arranged substantially as herein specified, in combination with a carriage composed of a series of bars, or their equivalent, for carrying the soap to be cut; between which bars the wires are stretched, as specified, for the purpose of cutting soap into slabs, bars, or cakes, as set forth. And, Secondly,—in combination with the above, keeping the wires under tension by means of weights or their equivalent, so that they shall yield, instead of breaking, when exposed to undue strain, as specified.—[*Inrolled January*, 1853.]

To ROBERT NEWELL, *of the City of New York, in the United States of America, lock manufacturer, for certain new and useful improvements in the construction of locks.*—[Sealed 15th April, 1851.]

THIS invention has firstly and principally for its object the construction of locks in which the interior arrangement, or the combination of the internal moveable parts, may be changed at pleasure, according to the form given to or change made in the key, without arranging the moveable parts of the lock by hand, or removing the lock, or any part thereof, from the door or lock. In locks, as heretofore constructed, in which the combination of the internal moveable parts depends on or is altered by the form given or change made in the key, the change in the lock, rendered necessary by the change in the key, could not take place without arranging the moveable parts by hand—removing the lock, or some part thereof, from the door or lock, for the purpose of adapting the internal parts of the lock to such altered form of the key,—such removal being attended, in some instances, with a decreased degree of security, and being, in all cases, inconvenient. But in the locks constructed according to this invention, the key may be altered at pleasure, and the arrangement of the internal moveable parts may be changed and adapted to the key without arranging the parts by hand, or removing the lock,

or any part thereof. The act of locking or throwing out the bolt of such lock produces the particular arrangement of internal moveable parts that corresponds to the peculiar form of the key for the time being; which form is retained until the lock is unlocked; and, upon this being done, the internal moveable parts return to their original position with reference to each other; but these parts cannot be brought back into their original position, except by a key of exactly the same form and dimensions as the key by which such arrangement was produced in the act of locking.

In Plate VII., fig. 1, is an internal elevation of a lock, constructed according to this invention, and shewn in a locked state; fig. 2, is a horizontal section; fig. 3, shews the parts in an unlocked state; fig. 4, is a detached view of the bolt, exhibiting the reverse side to that represented in figs. 1, and 3; fig. 5, is a side view and fig. 6, an end view of the key; and figs. 7, shew several of the changeable or moveable bits 15, which are fitted to the stationary bits 13, of the key, and secured thereto by the screw 16. C, is the box or casing of the lock. D, is the bolt, passing through the case of the lock at the front end, and sliding on the pin marked 1, at the back end of the casing, as is common with all tumbler-locks. *a, a,* are the slides, which move between the studs 2, and rest on the stud 19, and also on the upper end of the wall-plate 21,—each slide having a spring 3, to press it down to its proper place after having been raised by the key. *b, b,* are secondary-slides, fitted and sliding on the guide-stumps 4, affixed on the bolt. Each slide *a,* has a tongue 5, at its end, which slides in between the two jaws 6, of the secondary slides *b*. *c,* is a cramp-plate, fitted over the secondary slides, and kept in its proper position by the studs 4. A shank-pin 7, passes through the plate *c,* through a slot in each of the secondary slides, and through a hole in the bolt; and upon its end a nut 8, is screwed, having a tooth 9, which, when the nut revolves, operates on the "tusk" at the crooked end of the lever *d*. This lever works at the back of the bolt on the fulcrum 10, having a small spring 11, to keep it in place, and a notch to catch on the pin 1. The object of the nut 8, is to hold the whole series of secondary slides *b,* in their places by drawing the cramp-plate against them; and it is tightened by the secondary key shewn at fig. 8, which enters the small key-hole *g,* at the back of the lock.

The operation of locking the above-mentioned arrangement is as follows:—The key shewn at fig. 5, is introduced through the key-hole, and, on being turned, each of the

several moveable bits 15, (figs. 5, and 7,) lifts its corresponding slide *a*, and the tongue 5, of each slide, carries with it its corresponding secondary slide *b*. The key is turned round until the stationary bit 13, of the key-head comes in contact with the "talon" 17, of the bolt,—the slides being placed, by their several bits, in their relative positions; but the bolt D, cannot be projected or thrown until the notch in the lever *d*, is raised from the pin or stump 1, as shewn in fig. 4. The secondary key, fig. 8, is now inserted at the back key-hole *g*, (the pins, in the end of the said key, fitting into corresponding holes in the nut 8,) and, by turning it, the nut 8, which is on the pin 7, is caused to tighten the cramp-plate *c*—at the same time bringing the tooth 9, in contact with the crooked end of the lever *d*, on the back of the bolt, and thereby raising the lever and releasing it from the pin 1. The secondary key is now withdrawn, the door closed, and the bolt projected. The condition of the several parts will be as shewn in fig. 1, where the bolt has carried forward with it the secondary series of slides, which are held in the position given them by the several bits in the key by the cramp-plate *c*; and the slides *a*, have been pressed down to their original position by the spring 3. The result is, that the secondary series retains the form imparted to it, while the first series is detached and the tongue 5, withdrawn from the jaws 6. Should any attempt be made to withdraw the bolt, the jaws of the secondary series will come in contact with the several tongues 5, on the first series; so that nothing but the original form of key (that is, a key of the same form and dimensions as that by which the bolt was locked or projected) will pass the whole of the tongues in between the several jaws in the secondary series of slides. The metallic wall 21, is to prevent any communication from the key-hole to the secondary series of slides.

Figs. 9, and 10, are internal elevations of a lock constructed according to this invention, with a third or intermediate series of slides; fig. 11, is a horizontal section, and figs. 12, 13, and 14, are vertical sections thereof; and figs. 15, and 16, exhibit the cap or moveable plate of the lock, fitted with a detector tumbler. A, is the box or case of the lock; and B, is the bolt. *a*, *a*, indicate a series of slides, having two rectangular arms a^3, a^5, projecting therefrom, and working over the upper part of the metallic wall 10, 11, and 12; and on the outer end of the rectangular arm a^3, there is a tongue or tenon 18. The lever marked a^4, working on the pin 16, and operated upon by the spring 17, presses the slide *a*,

back to its place. b^1, is the secondary slide, having, at its upper end, a notch or recess 30, which fits on the end of the slide 18; and a little below this recess there is a series of notches 31, which correspond, in their distances, with the difference of the length of the moveable bits on the key. 29, is a rectangular tongue, fitting in between the jaws 24, of the third or intermediate series of slides a^9, (one of which is shewn detached at fig. 17,); and between each of these slides a^9, are followers a^8, (shewn detached at fig. 18,), which, on lifting the slides, are raised by the levers a^0, pressing against the tip or projection 23. b^2, is a rectangular lever, which turns on a pin 32, and is furnished with a tooth 33, intended to catch into the series of notches on the secondary series of slides b^1; and on the back end of this lever there is a small projection 36, which, as the bolt B, moves forward and backward, is operated upon by the set-off 34, and pin 35, in the stationary stud b^3.

a^6, is what the patentee terms a dog, which turns on a pin or stump 19, on the case of the lock, and catches into the notch 6, when the bolt is unlocked, and into the notch 7, when locked. 21, is a pin on the dog, overlaying and resting on the top edge of the series of slides. b^8, is another dog, turning on the stump-pin 41, and catching into the notches 43, and 44, on the lower edge of the back end of the bolt;—the pin 45, on the lower end of this dog reaches through the cap of the lock. On the lower part of the lock there is another dog b^5, working on the pin 37, which is also fastened to the case of the lock,—the dog being pressed to its work by the spring 38. The arm or stump b^6, of this dog falls into the notch 39, on the lower end of the bolt B, when the bolt is in a certain position, and thereby causes the tooth 40, to catch into a series of notches on the followers a^8.

a^7, are strips, which separate and keep in their places the slides a, and are held in their places by the pins 2, and studs 14. a^x, is another form of strip (shewn separately at fig. 19,) which separates the secondary and intermediate series of slides b^1, and a^9; and these strips a^x, are held in their places by the plate b, and stumps 28, on the bolt, which also form guides for the secondary series of slides b^1. The stumps 27, and wall 11, and 12, serve as guides for the third series of slides and followers.

c^4, is a circular curtain or revolving-chamber (shewn in end view at fig. 9, and in side view at fig. 20,) which is excentric to the drill-pin 57, and also excentric to the motion of the key; it works in a circular groove 58, in the back of the lock,

and in a corresponding groove 59, in the cap C; and around it there is formed a cam-piece c^5, to operate on the auxiliary-slide *c*. The piece 62, fills the space below the revolving-curtain or cylinder, and completes the chamber of the key. The part 64, is a safety-plug, inserted into the back of the lock; and 57, is the drill-pin, on which the key turns. *c*, is what the patentee terms an auxiliary slide (shewn detached, in side and edge view, by figs. 21,) overlaying the first series of slides *a*, and, with its arm, the second and third series b^1, and a^9. Fixed near the centre of this arm is a pin 48, which passes over the top of the upper jaw of the intermediate series. The plate *c*, has also a pin 49, reaching over the top of the first series of slides *a*, and another pin 47, reaching through the cap of the lock. 53, is a stump on the bolt, passing through the cap C, of the lock. D, is the cap or detector-tumbler, which turns on the pin 50, affixed to the cap of the lock, and is depressed or carried to its place by the spring 51. The portion c^1, of the tumbler has an elongated slot in it, to receive the pin 47, of the auxiliary slide *c*. The radial slot and gating 54, is to receive the stump 53, on the bolt. 52, is a portion of the tumbler, which the stump 53, must pass before the tumbler can return to its place. The lower projection or arm c^6, reaches out and operates against the dog-pin 45. The slot 55, is to pass the shank of the key.

Fig. 14, represents a section of the position of the first series of slides, and also a section of the changeable bits in the key. 67, is the bolt-bit of the key; and 68, are the moveable or permutating-bits of the key. 56, is a groove, turned on the shank of the key, in which the detector-tumbler D, fits and slides. *d*, is the shank of the key.

The movements of the above-mentioned parts, in the act of locking and unlocking, are as follows:—Fig. 15, shews the lock ready for the insertion of the key. Now, by placing the key on the drill-pin 57, and turning it from left to right, carrying with it the revolving curtain c^4, the cam-pieces 60, of the curtain are brought into contact with the lower edges of the auxiliary slide *c*, and raise it,—the pin 47, on the upper part carrying with it the cap or detector-tumbler D, and so causing it to turn on the pin 50. The portion c^3, (fig. 16,) covers the key-hole; at the same time, the portion c^6, by pressing on the dog-pin 45, releases the dog b^8, from the notch 43, on the bolt; and the gating 54, is brought into the position shewn at fig. 16, so as to allow the stump 53, on the bolt to pass out. The groove 56, in the stem of the key, allows the detector-tumbler to pass, and, at the same time, hugs it

close against the face of the lock,—thereby preventing anything from being inserted with a key, or any form of picking instrument, and also preventing the possibility of the internal arrangements of the lock being inspected.

Now, with reference to the operation of the key inside the front plate C, of the lock:—On the key being turned, each of its moveable bits 68, raises a slide a, to a height corresponding to the length of such bit 68; the slide a, carries with it its secondary slide b^1, by means of the tongue 18, on the rectangular projection a^3; the secondary slide b^1, carries with it its intermediate slide a^9, by means of the tongue 29, passing between the jaws 24; while the lever a^0, presses and carries up the follower a^8. At the same time, some one of the notches 31, on each of the secondary slides b^1, is presented in front of the tooth 33, on the lever b^2; and the slide a, which is operated on by the longest bit of the key, raises the dog a^6, by means of the pin 21, and releases it from its notch 6, in the bolt B. The stationary bit 67, (fig. 14,) of the key, now presses against the locking-talon 4, of the bolt B, and the bolt passes out, carrying with it the secondary series of slides b^1, by means of the two stumps 28, on the bolt. The projection 36, on the back of the lever b^2, is now brought into contact with the set-off 34, on the stump or stationary stud b^3, thereby causing the tooth 33, to enter into the several notches 31, that are presented to it on the secondary slides b^1, and hold them at the several elevations given to them by the key through the medium of the first series of slides a,—the connection being broken between the first and second series by the tongue 18, releasing itself from the notch 30, and between the second and third series by the tongue-piece 29, withdrawing from between the jaws 24.

The connection of the several parts being now broken, and the bolt being fully projected, the key passes round, allowing the slides a, to fall,—carrying down with them the followers a^8, and permitting the intermediate series to fall with them to their original position, as before locking, and also allowing the dog a^6, to fall into the notch 7, at the back of the bolt. The revolving excentric curtain or cylinder being brought round again to its original position, as shewn in fig. 9, allows the auxiliary slide c, to fall also to its original position, carrying with it, by the pin 48, any of the intermediate slides that might otherwise be caused to stick fast by any dirt or other obstruction; and the cap or detector-tumbler D, at the same time, returns to its original position, releasing its hold on the dog-pin 45, so as to permit the dog b^8, to be

pressed into the notch 44, at the back of the bolt, and bringing the portion 52, behind the stump 53, of the bolt. The lock is now fully locked, and everything in its proper place.

In order to throw back the bolt, it will be evident that every one of the before-described pieces, in detail, must be brought back into precisely the same position. To relieve the dog b^8, and bring the gating 54, to its proper height to allow the stump 53, to pass, the detector-tumbler must be moved from right to left and cover the key-hole. To reach any of the slides a, the revolving curtain c^4, must be moved round. To release the dog a^6, from its hold in the bolt B, some one of the slides a, must be raised to its highest position. To allow the tongue 29, on the secondary slides b^1, to pass between the jaws 24, on the third or intermediate series, each of the intermediate slides must be raised into the exact position given to it in locking the lock, or the bolt B, cannot be withdrawn,—thereby requiring the exact key, or its duplicate, to unlock it.

The following are the peculiarities of this construction of lock, by means whereof the patentee guards against any known means of feeling, seeing, or in any way overcoming the obstruction to the withdrawing of the bolt, which constitutes its security:—Should that portion of the detector-tumbler, which covers the key-hole, be cut or filed away through the key-hole in the door (for the purpose of seeing the plates when the revolving curtain is turned round by the key, or to have more room to work with the picking instruments), then the part c^6, of the detector-tumbler, being secured by rivets to the part that covers the key-hole, will fall, leaving no means of relieving the dog b^8, from its notch on the bolt. Should the revolving curtain be destroyed in any way, the effect would be that the auxiliary tumbler c, would not be raised to its proper position to move (by means of its pin 47,) the detector-tumbler to the right position to allow the stump 53, to pass the gating 54, and the arm c^6, to relieve the dog b^8, from the back of the bolt by pressing back the pin 45. Or, if an attempt be made by any instrument to withdraw the bolt, by taking hold or pressing against the unlocking talon 5, of the bolt B, it will be held firmly in its position by the dog a^6, holding into the notch 7. But should the dogs a^6, and b^8, be relieved, by placing the detector-tumbler in the right position, and raising some one of the slides a, to a sufficient height, the bolt will then slightly recede, bringing in contact the tongues 29, of the

slides b^1, with the jaws 24, of the slides a^9, and, at the same time, allowing the arm b^6, of the dog b^5, to fall into the notch 39, of the bolt: the tooth 40, being pressed by the spring into the notches on the bottom of the followers a^8, holds them; while the tongues 29, of the slides b^1, abutting against the jaws 24, of the slides a^9, hold them in such a position that the bolt cannot be withdrawn. It will be readily understood that the pressure applied to the bolt is brought to bear against the intermediate or third series by the tongues 29, coming against the jaws 24. The slides a, being detached from the followers a^8, are left perfectly at liberty,—thereby preventing the possibility of feeling the obstructions; while the metallic walls 10, 11, 12, and 13, (having an opening, sufficient only for the elbow a^3, of the slides a, to work through) prevent, by any further means, the possibility of reaching that portion of the lock that contains the intermediate and secondary series of slides. The key being susceptible of changes, corresponding in number to the permutation of the number of moveable bits in it, and the form of the key being imparted to, and retained by, the secondary slides, which are excluded from being reached through the key-hole by the several provisions before stated, the possibility of ascertaining the form or arrangement of the secondary series of slides is prevented.

The following means prevent the lock from being forced from the door, or the works being injured, by the explosion of gunpowder:—The revolving cylinder c^4, together with the filling-piece 62, forms a perfect chamber, and prevents the possibility of passing any gunpowder into the body of the lock; but should this chamber be filled with gunpowder and exploded, the plug 64, on the back of the lock, yields to its force, relieving the internal pressure,—thereby preventing the possibility of injuring the machinery of the lock. Or, should the locking talon 4, of the bolt B, be cut away, so that the bolt would not be fully projected by the key (thereby preventing the several parts from falling to their proper position), the cap or detector-tumbler would prevent the withdrawing of the key.

The internal moveable parts, which, according to their peculiar arrangement and combination, give the special form to the lock, consist of pieces moving between guides in right lines, commonly called slides, as contradistinguished from the tumblers usually employed in the construction of locks, which are pieces moving about centres; it will, however, be obvious

that the properties and peculiar characteristics above described may be obtained by means of two series, or by means of two series with an intermediate series of tumblers moving about centres; but such tumblers are not so convenient as the slides above described, in cases in which the third or intermediate series is employed.

The patentee claims, First,—the constructing, by means of a first and secondary series of slides or tumblers, a changeable lock, in which the particular form imparted by the key to the first and secondary series of slides or tumblers is retained by a cramp-plate, as above described. Secondly,—the constructing, by means of a first and secondary series of slides or tumblers, a changeable lock, in which the form or arrangement of parts of the lock imparted by the key is retained by means of a tooth or teeth and notches on the secondary series of slides or tumblers. Thirdly,—in the construction of locks, the application of a third or intermediate series of slides or tumblers, for the purposes above described. Fourthly,—the application of a dog, with a pin overlapping the slides or tumblers, as shewn at fig. 10, for the purpose of holding in the bolt when the lock is locked or unlocked, as above described. Fifthly,—the application of a dog b^8, operated on by the cap or detector-tumbler, for holding the bolt, as above described. Sixthly,—the application of a dog b^5, for the purpose of holding the intermediate slides or tumblers, as above described. Seventhly,—the application to locks of curtains or rings, turning and working excentrically to the motion of the key, as above described, for preventing access to the interior parts of the lock. Eighthly,—the application to locks of a safety-plug or yielding-plate at the back of the chamber formed by such excentric revolving curtain. Ninthly,—the application to locks of a strong metallic wall, for the purpose of separating the safety and other parts of the lock from each other, and preventing access to such parts by means of the key-hole. Tenthly,—the application to locks of a cap or detector-tumbler, as above described, for the purpose of closing the key-hole as the key is turned. Eleventhly,—the constructing a key by a combination of bits or moveable pieces, with tongues fitted into a groove, and held by a screw, as above described. Twelfthly,—the constructing of a key having a groove in its shank to secure the detector-tumbler, as before described.—[*Inrolled October*, 1851.]

To JAMES DENTON, *of Oldham, in the county of Lancaster, spindle and fly-maker, for certain improvements in machinery or apparatus for preparing cotton and other fibrous materials.*—[Sealed 29th July, 1852.]

THIS invention relates to certain improvements upon a construction of presser-flyer for slubbing and roving-frames described in the specification of a patent granted 8th December, 1843, to Joseph Lamb. The improvement in the flyer therein described and now referred to consisted in the adaptation to the presser-finger of a lump or weight, placed at the opposite side of the flyer-leg, but connected immediately to the boss of the presser, and therefore situate at the lower part of the leg. Now, according to this invention, it is proposed still to employ a lump or weight, but to remove it to the upper part of the leg, mounting it thereon according to two methods hereafter described, and connecting it to the boss of the presser-finger by means of an intermediate rod.

In Plate VIII., figs. 1, and 2, are views in elevation of a single presser-flyer; and fig. 3, is a plan view of the presser-finger and the parts to which it is connected. The presser-finger *a*, is mounted upon the leg *b*, by means of a boss, so as to turn as usual; and at the other side of this boss is a projection, to which a rod *c*, is attached. The rod *c*, at its upper end carries the lump *d*, the inward portion whereof is formed upon or attached to a short tube, which is turned round the leg of the flyer, so as to be retained thereon, but is loose enough to allow the lump or weight to turn. Therefore, as the finger, by the formation of the bobbin, is caused to move outward, the weight or lump will turn with it on the opposite side to the centre of motion, and constitute a balance, acting, at the same time, with sufficient force to keep the presser in contact with the material. Upon the leg of the flyer there is a projecting-pin *e*, corresponding to a slot *f*, made in the boss upon which the finger *a*, is formed or attached; and this pin, by forming a stop to the end of the said slot, will prevent the presser from flying out beyond a certain distance.

Figs. 4, and 5, represent the second method of mounting the lump or weight. The presser-finger *a*, is, as before described, connected to the weight *d*, by the rod *c*; in this instance, however, the weight does not encircle the leg of the flyer, but is guided by means of a flange *g*, formed with a circular slot, through which the connecting-rod *c*, passes: this flange is shewn below the lump or weight, but may, if desired,

be placed above,—a continuation of the rod *c*, passing through its slot.

According to the above description, the motion of the lump or weight will be concentric to the centre of the leg of the flyer; but such an arrangement is not indispensable; for, if desired, a motion excentric thereto may be adopted.

Fig. 6, represents, in sectional plan view, a method of effecting this modification. The lump or weight *d*, is connected, as before, to the boss of the presser-finger by a rod *c*, which passes through a slot formed in a flange *g*, attached to the leg of the flyer. This slot is excentric to the centre of motion of the presser, and will therefore force the lump or weight to move in that direction; but, as such excentric slot recedes from the centre of the flyer-leg, the weight will move outward, as the finger performs a similar motion, and the balance will, in great measure, be maintained.

In the above description single presser-flyers only have been alluded to; but it will be obvious that double pressers may be constructed in precisely the same manner.

The patentee claims, as his invention,—the adaptation of a lump or weight, mounted at the upper part of the flyer-leg or legs by the methods above described, and connected to the presser-finger, so as to move therewith.—[*Inrolled January*, 1853.]

To John Trotman, *of Dursley, Gloucestershire, for improvements in anchors.*—[Sealed 20th April, 1852.]

The improvements which constitute this invention are chiefly applicable to that class of anchors known by the name of "Porter's anchors." They consist, firstly, in forming or fixing the palm intermediately of the breadth of the arm; secondly, in forming the horn wider than the arm; and, thirdly, in forming or fixing the palm of anchors, made on Porter's plan, at the back of the arm.

In Plate VIII., fig. 1, is a side view, and fig. 2, an edge view of part of an anchor made in the manner originally proposed by Mr. Porter, the horn *a*, of which, it will be seen, is only of the same width as the arm *b*, at that part. Fig. 3, is a side view of an anchor, constructed according to the first and second improvements above mentioned, and fig. 4, is an edge view of the arm of the same. In this anchor, the horn *a*, forms part of the palm and is wider than the arm *b*; and this is stated to be an important improvement in the construction of Porter's or other anchors. The palms *c*, instead

of being placed at the front of the arms, are formed or fixed intermediate of the breadth of the arms, in making Porter's or other anchors: this improves the holding power of the anchor, and admits of the palms being formed or fixed at a different angle from that of the arms. Fig. 5, exhibits an anchor constructed according to the third improvement, with the palms at the back of the arms and the horns forming part of the palms. The patentee says he is aware that it is not new to place the palm at the back of the arm of ordinary anchors; but his improvement consists in fixing the palms to the back of those arms of anchors which move on axes. The angles which the faces of the arms and the faces of the palms make with the shank and with each other may be varied; but it is important that the angles which the palms make with the shank and those which the arms make with the shank should be different.—[*Inrolled October,* 1852.]

To Richard Laming, *of Millwall, in the county of Middlesex, chemist, for improvements in the manufacture and the burning of gas; in the treatment of residual products of such manufacture, and of the distillation of coal or similar substances, and of the coking of coal.*—[Sealed 12th August, 1852.]

The first part of this invention relates to the brick ovens which are sometimes used for the purpose of lessening the cost of manufacturing coal-gas, by producing, at the same time, a coke sufficiently dense for locomotive and foundry furnaces. The improvement consists in building such ovens in close cases of sheet-iron, furnished with such openings as are necessary, and which are either fitted with doors, or put into communication with the passages for the gas, as is the practice with ovens constructed without the iron cases. More than one oven may be built within a case, if required. When ovens, thus encased, are used, the gas is not so liable to become contaminated with atmospheric air as when the ordinary construction of ovens is employed in the manufacture.

The patentee claims enclosing ovens, wherein coal-gas and heavy coke are simultaneously produced, in cases of sheet-iron.

Inflammable gases are sometimes made by decomposing steam, by bringing it into contact with highly heated iron, or other substances known to be suitable for that purpose; and in certain processes used in that manufacture, the steam is made to pass at a red heat through pipes made of iron, which,

in consequence, become rapidly destroyed. Now, part of this invention consists in conveying the red hot steam, intended to be decomposed into gases, through pipes made of or lined with platinum, which is almost indestructible under such circumstances.

The claim is for the use of platinum channels or pipes, for conveying superheated steam to materials destined to decompose it into gases for giving heat or light by their combustion, either alone or when combined with gases derived from other sources.

There is a certain residual product of the purification of coal-gas which contains sulphur, mixed with certain compounds of iron, and generally also of calcium, and with ammonia and vegetable or carbonaceous matter. Part of this invention consists in converting such residue into a substance proper for purifying gas, and in obtaining from it, at the same time, vapours of sulphur, which are applied to useful purposes. The operation is as follows:—The residue is exposed to the atmosphere on an iron plate or a hearth, heated by a fire or a flue beneath, until the sulphur contained in the residue burns with its characteristic blue flame; then, by means of a damper, the residue is protected from any further elevation of temperature, and it is stirred until the sulphur has almost entirely burned away. When this has taken place, the hot residue is either quenched by the application thereto of steam or water, or it is exposed in a heap to the air, to permit any carbon which it may still contain to burn slowly away. The resulting mass, which consists chiefly of oxide of iron, when somewhat damp, is fitted for the purification of coal-gas from its sulphuretted hydrogen; and, for this purpose, it is again used in what are called dry lime purifiers, in the manner now practised with oxide of iron, or as hereafter described with respect to the said oxide. The patentee prefers to stir the mass, while the sulphur is burning off, by machinery driven by steam power; and he encloses the machinery under a cover, fixed over the plate or hearth, and made with two apertures, one for admitting air to the burning sulphur and charging and discharging the apparatus, and another by which the sulphurous acid which is formed may be conveyed away. By means of a chimney draft, or a pumping or forcing machine, a current of atmospheric air is caused to sweep over the heated residue on the plate or hearth, and finally to pass, together with the sulphurous acid which is formed, into covered vessels, partly filled with raw or distilled gas liquor, or containing ammonia, its carbonate, or its hydrosulphate, dissolved in

water, or otherwise, or else one or more of the corresponding compounds of the oxides of sodium or potassium. The sulphurous acid becoming absorbed, there results in the said vessels a sulphite or hyposulphite, or both, or a solution of sulphur in a sulphite of the particular alkaline base employed,—the uncondensible gases being allowed a means of escape.

The patentee claims the regeneration of the aforesaid spent purifying materials, by burning off sulphur in the way described,—that is to say, with no more heat than is requisite to cause it to burn, and, with stirring, to keep down the temperature; and also the use of the aforesaid chemical re-agents, or either of them, for absorbing the sulphurous acid which results from burning the sulphur in the aforesaid spent materials, either in the way described or by otherwise exposing them to heat with access of air.

The fourth part of this invention consists in obtaining from the residual products of the purification of gas, above referred to, crude sulphur and oxide of iron, either mixed together or separate. The process is as follows:—The residue is put into a pug-mill, or other suitable apparatus, and agitated with water until its finer parts become suspended; and then the whole is run out upon a metallic cloth or sieve, just fine enough to arrest everything larger than ordinary sawdust,—the operator having first placed below the sieve a second one, made of wire gauze, of a fineness similar to that in common use for blinds, which serves to retain everything but the liquid itself, and such impalpable powders as it holds in suspension. The liquid being left at rest, oxide of iron and sulphur, mixed perhaps with other matters, become deposited; and, when this has taken place, the liquid is drawn off and the sediment first placed on a filter to drain, and afterwards dried, either in the air or by artificial heat. The sulphur may be separated from the above deposit, and also from the residual product of the purification of gas, above referred to, by exposing the substances respectively in any suitable vessel to a current of superheated steam (a temperature of about 300° answers the purpose), whereby the sulphur is carried off to be received with it into water; from which it may afterwards be recovered by subsidence, the steam leaves the iron behind in a condition conducive to its subsequent usefulness for purifying gas, either immediately or after a short exposure, in a moistened state, to the atmosphere.

The patentee claims the process above described for recovering oxide of iron which has been used for the purification of gas, together with the sulphur which it has extracted from

the gas; and also the use of superheated steam for separating the said sulphur from the said oxide.

The fifth head of the invention consists in purifying gas from its sulphuretted hydrogen by means of mixtures containing oxide of iron, without the necessary formation of sulphuret of iron, which is consequent on the ordinary mode of working. Oxide of iron is in a very good condition for the above purpose, after it has been exposed for a few minutes in a hydrated state to a low red heat; but it may be used in the hydrated state itself, as well as in certain other conditions of minute disintegration, not well understood by chemists. It may be mixed with a diversity of materials, which do not seem to impair its action; and the oxide of iron recovered by the means above recited may be used. The oxide may generally be known to be in a proper condition for carrying out this part of the invention, when on exposing a grain or two of it, in the presence of atmospheric air, to a small current of sulphuretted hydrogen, the oxide is observed to become red hot,—the sulphur, at the same time, separating from the hydrogen, and ascending in a visible state. A sufficient quantity of the oxide, in a proper state of efficiency, is mixed with an adequate proportion of sawdust, or other unobjectionable matter, to ensure the gas a free passage through it when in a damp state, and placed in layers a few inches thick on one or more shelves of some dry lime purifiers; and then the gas is caused to pass into the purifiers,—the operator having first mixed with the gas a volume of oxygen gas equal to the volume of sulphuretted hydrogen by which it is contaminated: the proper proportions may be measured by means of two vessels similar to the ordinary gas-meters, both turning on the same axis,—the capacity of one being to that of the other as the volume of oxygen gas to be introduced is to the volume of gas to be purified The action of the oxide of iron under these circumstances is very remarkable, the oxide for the most part seeming never to be changed into a sulphuret by the gas which it purifies, but, without ceasing to be oxide, causing the sulphuretted hydrogen and the oxygen in the gas to re-act upon each other, as they rise to its surface, setting free the sulphur to become mechanically deposited. This peculiar action permits the process of purification, by a given quantity of oxide of iron, to be continued until the material has become so impervious to the gas, in consequence of the large quantity of sulphur deposited in it, as to make its longer employment objectionable.

The patentee claims, as regards this head of his invention,

the purification of gas from its sulphuretted hydrogen by the united agencies of oxide of iron and oxygen gas. In connection with the foregoing part of the invention, he also claims the application of the following process for obtaining oxygen gas, to be mixed with the gas to be purified:—He has found that, when artificial peroxide of manganese is reduced by heat to a lower state of oxidation, it recovers more or less of its oxygen on being exposed at about a low red heat to the atmosphere,—which is a property not possessed by native peroxide of manganese. His process for obtaining oxygen gas, to be used in the gas purifiers, consists in first exposing artificial peroxide of manganese in a retort to a temperature great enough to drive off a portion of its oxygen, and then to expose it at a lower heat to the air until oxygen is re-absorbed, when it may be again usefully heated in the retort, and thus used many times in succession.

The object of the next part of the invention is to render it less frequently necessary to open the vessels wherein gas is purified from its sulphuretted hydrogen, by the agency of oxide of iron and oxygen gas, or of oxide of iron and atmospheric air. For this purpose, the purifying material, which contains the oxide of iron, is spread in two or more horizontal layers, each a few inches thick, and occupying the whole area of the purifying vessel; and the gas is caused to enter the vessel below the undermost layer, pass through each layer in succession, and escape from the vessel at some point above the uppermost layer. It follows, from this arrangement, that all, or nearly all, of the sulphur separated from the gas becomes deposited in the lowest layer, eventually impeding the free passage of the gas through it before the other and higher layers have done much service. When the resistance to the passage of the gas has become inconveniently great, the patentee causes a hole, at least equal in area to the orifice of the inlet-pipe, to be opened through the lowermost layer of material, either by sliding away or turning into a vertical position a portion of the sieves whereon the purifying material rests: this is effected by means of a rod, passing air-tight through the side of the vessel. The second layer in succession being thus made the first through which the impure gas has to pass, becomes, in its turn, gradually choked with sulphur, and eventually requires to have a similar hole opened through it; and so with all the several layers in succession, except the last, when, instead of a hole being opened, the vessel will require to be charged with fresh material.

Under this part of the invention, the claim is for the means

above described for throwing out of action successive layers of purifying material, as they are made inconveniently impervious to the gas by the deposition of its sulphur, caused by the re-action of its sulphuretted hydrogen on oxide of iron, in conjunction with oxygen gas or atmospheric air.

The seventh head of this invention refers to a means of supplying heated air for the combustion of gas for illumination. The new apparatus consists of a vertical argand burner, with two glass holders, adjusted concentrically to it, and sliding up and down upon it, as in the case of the single glass holder of the Carcel lamps. The two glass holders are of unequal diameters, and the smaller one is placed about half an inch above the larger one,—the two being so connected together by a tube, surrounding the burner, that both may be made to slide up and down together. Each of the holders carries a glass, which is either of a cylindrical shape or of some other ordinary form,—the inner glass being the taller of the two. The floor of the lower glass holder is a solid flat ring; and the floor of the upper glass holder is made as pervious to air as possible. The two concentric glasses are in no part distant from each other less than about half an inch; and the whole apparatus is so contrived as to cause all the air which supports combustion to arrive at the flame by first descending the channel formed between the two concentric glasses: there is no opening by which the air may enter the burner from below, as in ordinary cases. Part of the air, when it has arrived at the bottom of the channel above named, turns under the edge of the inner glass, and then, ascending within it, acts on the external surface of the flame; while another portion of the air passes to the inner surface of the flame, through lateral circular openings in the tube which connects the two glass holders together, and also through long vertical openings made through the sides of the burner itself. These longitudinal openings allow the glass holders to slide up and down without closing any part of the smaller circular openings, and, being made to correspond in width, number, and position, with the circular openings, these will be partially closed whenever the glass holders are turned round upon the burner. The elevated temperature acquired by the air, as it is thus made to approach the flame, greatly improves the intensity of its light; but it is apt to cause the inner glass to become fused: the patentee, however, avoids such an accident by excluding lead from the materials of which the inner glass is made. In applying this apparatus to obtain the most perfect combustion of a given quantity of gas, he simply raises or lowers the

adjustable glass holders—turning them round a little when necessary, until they have attained their most favorable position for effecting the desired object, which is indicated by the increased brilliancy of the light.

The patentee claims the combination of the two concentric glasses, one of them without lead in its composition, by which the air may be heated as it arrives to support combustion; and also the arrangement of adjustable glass-holders and the holes by means of which the supply of the heated air may be augmented or diminished at pleasure.

The eighth part of this invention has reference to a new combination of processes for converting into sulphate of ammonia the ammoniacal products resulting from the operations of gas works, from the distillation of coal or other similar substances, and from the coking of coal. For this purpose, the patentee first converts the said ammoniacal products, by any known means, into ammonia or the carbonate of that base; he next submits either or both of these re-agents to the action of sulphurous acid, obtained in a gaseous or fluid form, by any known means; and, lastly, he exposes the sulphite of ammonia, which thence results, to the simultaneous influences of air and water, whereby it is rapidly converted into a solution of sulphate of ammonia, which may be evaporated and crystallized in the usual way. The means preferred for converting the ammonia or carbonate of ammonia into the sulphite of that base is to pass sulphurous acid, in a gaseous form, over the ammonia or its carbonate, in solution, contained in long and shallow leaden chambers;—care being taken that no notable quantity of hydrosulphate of ammonia be present, as the presence of that re-agent would be injurious to the sulphate of ammonia in the subsequent processes of evaporation and crystallization.

The claim under this part of the invention is for the manufacture of sulphate of ammonia from the ammoniacal products above referred to, by the combination of processes above recited.

The last part of this invention refers to the manufacture of sulphate of alumina and alum. The coke of Boghead, or other coal of like nature, is burned in the open air, to reduce it to a white ash,—taking care that the ignited coke never lies in heaps of more than a few inches thick, and that its temperature never rises, from any cause, high enough to fuse together the alumina and the silica with which this kind of coke abounds. The white ash, thus made, or obtained in any other manner, is lixiviated in leaden vessels with repeated

doses of hot sulphuric acid (the strength may be about 70 or 80 per cent.), until the ash is nearly exhausted of alumina. The solutions thus obtained are again heated and used for lixiviating one or more other portions of fresh ash,—each dose of the acid being withdrawn as it acquires its maximum quantity of alumina. The iron with which the solution of alumina is contaminated may be removed by any ordinary means. The solution is then to be concentrated by evaporation; or the sulphate of alumina may be made into alum in the usual way. Sometimes, instead of first reducing the coke to a white ash, the patentee lixiviates the coke itself in the manner described.

He claims the extraction of the alumina, from the coke or the ash of Boghead or similar coals, by hot sulphuric acid; and also the treatment of the coke of Boghead or similar coals, as above described, for reducing it to a friable ash.—[*Inrolled February,* 1853.]

To Richard Archibald Brooman, *of Fleet-street, for improvements in sounding instruments,—being a communication.*—[Sealed 19th December, 1851.]

This invention consists in certain improvements in that description of sounding instrument wherein the pressure of the water is made to indicate the depth to which the instrument has descended.

In Plate VIII., fig. 1, is a longitudinal section of the improved sounding instrument, enclosed within an outer casing, for the sake of protection, and to give additional weight to it; fig. 2, is an external elevation of the instrument, detached from its outer casing; and fig. 3, is a horizontal section, taken on the line 1, 2, of fig. 2. *a, b,* are two tubes, which may be of any relative diameter; but it is preferred that the tube *a,* should be about half the diameter of *b.* The tube *a,* which is made of glass, is fixed excentrically within a casing *c,* by means of a packing of plaster of Paris, so that it may come against and be visible through a long slot in the side of the casing *c,* and through a corresponding slot in the metal tube or casing *d.* This casing *d,* contains the metal tube *b,* as well as the casing *c,*—the remainder of its interior being filled with lead or like solid material; and upon its ends the caps *e, f,* are screwed. The tubes *a,* and *b,* communicate with each other at the top through a spiral channel *g,* formed by fixing two small buttons in the top of the tube *b,* with a stop between them, which causes the water to make a com-

plete revolution before it is discharged from the tube *b*, so as to prevent the escape of air when the instrument assumes a horizontal position, or is even inverted. The tubes *a*, and *b*, have no communication with the outside, except through a hole *h*, in the bottom of the tube *b*, and occasionally through an aperture in the cap *e*, when the plug *i*, is unscrewed. The instrument, when in use, is enclosed within a strong iron case *j*, formed with openings *k*, through which the water may have access to the hole in the bottom of the tube *b*.

Upon the outside of the casing *d*, at the side of the slot therein, there is a scale *l*, to indicate the height to which the water ascends in the tube *a*; and which height becomes the measure of the depth of water outside, on the principle to be now explained. The instrument being fastened to the deep sea line, and lowered overboard, the water enters through the hole *h*, in the bottom of the tube *b*, and forces up and compresses the air in the intercommunicating tubes *a*, *b*, with a force exactly proportionate to the depth to which the instrument descends. The amount of the atmospheric resistance being a fixed and known quantity, and the weight of a column of sea-water being also a fixed and known quantity, it follows that the height of the column of water in the tube *a*, must always be in exact proportion to the depth of water outside: thus assuming the pressure of the atmosphere to be 15 lbs. per square inch, and this to be equivalent to the pressure of a column of 32 feet of sea-water; then a pressure of one atmosphere would indicate a depth of 5⅓ fathoms; a pressure of two atmospheres a depth of 10⅔ fathoms; a pressure of three atmospheres a depth of 16 fathoms; and so on. The inventor therefore first ascertains, by experiment, the exact pressure required to make the water begin to overflow from the tube *b*, into the tube *a*, and then adopts that point as the commencement of the scale *l*: supposing it to be 45 lbs. per square inch—this would give 16 fathoms on the scale; then another atmosphere, or 60 lbs., would give 21⅓ fathoms; and so on progressively. However, as no two glass tubes are ever found precisely alike in diameter, it is impossible to form before-hand a scale of numbers suitable for all tubes; and such a scale, therefore, can only be arrived at in each case by actual experiment. For this purpose, it is found convenient to gauge a number of instruments at the same time (say twenty or thirty), enclosing them in a strong cylinder, filled with water, and having its top firmly screwed down, and applying the hydraulic pressure at the bottom.

The patentee claims the construction of sounding instruments in such a manner that the pressure of the water into

which they are made to descend shall cause an indicator or register-tube, enclosed therein, to be filled with water (or other fluid) to a height exactly proportionate to the depth of the descent or sounding; as also the graduated scale *l*, the spiral channel *g*, and the outer casing *j*.—[*Inrolled June,* 1852.]

To CHRISTOPHER CROSS, *of Farnworth, near Bolton, in the county of Lancaster, cotton-spinner and manufacturer, for certain improvements in the manufacture of textile fabrics, and in the manufacture of wearing apparel from textile materials.*—[Sealed 8th April, 1851.]

THIS invention relates to an improvement upon a method, at present practised, of manufacturing shapes, by loom weaving, suitable for being made into coats, trousers, mantles, shirts, stays, and a variety of other articles of apparel,—the principle of such operation consisting in weaving the intended shape with gores, or full portions, instead of producing a desired fulness by letting in the necessary parts by hand. This system of producing woven shapes has been the subject, under certain modifications, of various grants of letters patent, one of them to Jerome Andre Drieu, dated August 1st, 1849; and in order that the application of the present improvements may be perfectly understood, the patentee, in the first place, describes the general character of the operation as practised by J. A. Drieu and others, and, subsequently, the addition of his improvement, referring to the diagrams shewn in Plate VIII. Suppose, for instance, it is desired to weave a shape suitable for being made into an over-coat;—in order to effect this, that side of the machine which produces the portion of the shape intended to form the skirts, must give off more work than the centre part thereof, so that the required fulness and folds may be obtained. The workman commences weaving in the usual manner,—passing his shuttle between the warp by means of the picker-handle, as in ordinary hand-looms. This he continues until it is necessary to commence making more work at one or the other side of the loom (suppose, in this instance, the right-hand); in which case he may be imagined to have arrived at the part represented by the line *a, a*, b,* diagram No. 1. He will then commence inserting the weft, by means of a hand-shuttle, gradually nearer to the right-hand side of the loom, taking it out between the lines 15, 14, 13, &c., (which represent the warp-threads) one after the other, and working so many courses of treadles, at each space, as his instructions may direct, and continuing

thus until he arrives at the point *c*;—the work, as woven, being in the meantime beaten up in the ordinary way. By this proceeding, the required gore or fulness will have been manufactured within the points *a**, *b*, *c*. Let it now be considered necessary to weave the whole width of the shape;—the reed is brought forward so as to carry with it the woven gore, and bring its side *a**, *c*, parallel with the other part of the work, and with the face of the reed; and the whole is secured in that position by means of a suitable taking-up apparatus. Diagram No. 2, represents this position of the partly-woven shape. After this, the weft is thrown by the picker-handle across the whole of the warps, until another gore or fulness is to be commenced.

During the weaving of the gore, as above described, the warp-threads have been shed uniformly, as in ordinary weaving, presenting across their whole width two ranges of threads; and the workman has therefore been obliged to take out the hand-shuttle between two of them: thus, in the diagram No. 3, in weaving the gore above described, he has arrested the shuttle between 15, and 14, &c., and drawn it out between those threads, which involves the necessity of a strict attention, so as to insure the proper limited throw of the weft; and, in order to assist him in this, written instructions are furnished, stating the consecutive situations at which the weft is to be removed, and the corresponding number of picks to be made. The present patentee obviates these inconveniences by causing those threads which are not intended to interweave with the weft to fail in opening a shed,—thereby pointing out, by a self-acting process, the width to which the weaving is to extend. In order to effect this, he connects the warp-threads to a Jacquard or equivalent opparatus, by any of the methods commonly adopted in using such machinery; and then, supposing the shape represented at the before-mentioned diagram No. 1, to be required, the operation will be as follows:—The cards are to be pierced, or the equivalent apparatus so arranged as to shed the warp (according to the fabric required) across the whole width thereof, until the weaving has been carried to the line *a*, *a**, *b*; here the gore or fulness commences, and the cards or equivalent apparatus must be so pierced or otherwise arranged as to fail in bringing the necessary parts into action for shedding the warp, say from 14, to 37;—the other threads, however, being operated upon as in ordinary weaving, will be suitably disposed for the production of cloth; and the section thereof will be as at diagram No. 4. This having been accomplished, the shuttle may be passed through the required space from 1, to 14,—the end of the throw being

pointed out by the termination of the opened shed, without reference to other instructions. The warp-threads are now again to be shed, as in ordinary weaving,—the cards or equivalent apparatus again failing to lift those situate from 14, to 37, and the shuttle thrown back towards the right-hand. After this, the cards or equivalent apparatus may, for a certain number of picks, open a shed composed of all the warp-threads, so as to weave the entire width thereof; and then, after the manner already described, they may shed those represented by 1, to 12, only, as in diagram No. 5,—thus effecting an extra portion of weaving to constitute a decreased length of gore; and so on until the entire fulness shall have been completed. By this mode of operation, the workman is relieved from the duty of regulating the number and order of short picks, and has merely to attend to the operations of weaving an ordinary fabric; the motions of the loom pointing out, by the shedding of the warp, how far the weft is to extend at each pick,—the arrangement of Jacquard cards, or the equivalent apparatus, being, in fact, self-acting instructions to the weaver. The method of mounting the warp-threads, the mode of taking up the woven work, and the operations generally, may be effected as commonly practised in weaving stays with gores therein, or as described in the specification of the aforesaid J. A. Drieu; and motion may be communicated to the Jacquard, or its equivalent, by any method usually adopted when such apparatus is employed for shedding the warp. It will be evident, also, that two or more sets of warps may be employed, so as to weave more than one-fold cloth, as is now practised in the weaving of stays and other garment shapes.

In the foregoing description, the warp-threads, which are to fail in interweaving, are described as being kept down; but a similar effect will be produced if they are caused to occupy one line in the top range,—the only difference being, that, supposing an ordinary Jacquard apparatus to be employed, the cards must be so pierced as to miss all those needles belonging to the threads to be raised, and thereby leave their respective hooks to be lifted by the action of the "griff." As the warp-threads, which are not intended to be interwoven with the weft in order to procure gores, are, according to this invention, restrained from opening a shed, it will be evident that a shuttle may be thrown from side to side of the loom (that is to say, from box to box) with a uniform action,—thereby admitting of the application of power to the manufacture. In such case, however, instead of the method usually adopted for taking up the work (namely, the separate attachment of

straps, &c., to various parts of the width of the woven shape), a regular winding-on motion must be applied: this may be accomplished as described in the specification of J. A. Drieu, by causing the work-roller to be of irregular diameter, so that its periphery shall be of such unequal dimensions that the woven shape, when coiled around it, shall correspond thereto; or, instead of this, an ordinary work-roller may be employed, between which and the manufactured shape a coil of cloth shall be wound, having strips of India-rubber, or other suitable substance, attached thereto, so as to form projections, which shall increase the diameter of the roller at situations corresponding to the fulness produced by the woven gores,—the coil of cloth and its protuberances thus forming a packing, varying in thickness, so as to effect a taking-up of the shape in greater quantity at one portion of its width than at another.

The patentee observes that, if desired, the weaving of gores may be employed in conjunction with an invention for which letters patent were granted to him September 5, 1850; according to which invention, shapes, for being made into wearing apparel, are produced by forming irregular quantities of work in the direction of the width of the loom (that is, at right angles to the warp); and it will be obvious that, by operating upon that plan, and simultaneously effecting the weaving of gores, a greater variety of shape may be produced.

The patentee claims the application of a Jacquard, or other suitable apparatus, for preventing certain of the warp-threads from opening a shed, when shapes, for being made into articles of wearing apparel, are produced by the weaving of irregular quantities of work in the direction of the length of warp-threads.—[*Inrolled October*, 1851.]

To Frederick George Underhay, *of Wells-street, Gray's-Inn-road, engineer, for improvements in apparatus for regulating the supply of water to water-closets and other vessels, and in taps or cocks for drawing off liquids.*—[Sealed 8th March, 1852.]

This invention consists, firstly, in improvements in apparatus for regulating the supply of water to water-closets and wash-hand basins; secondly, in improvements in cocks or taps for drawing off liquids; and thirdly, in improvements in ball or float-cocks.

In Plate VII., fig. 1, exhibits the pan and other parts of an ordinary water-closet, together with the improved apparatus for regulating the supply of water. *a*, is the lever of the supply-

cock, which is acted upon by the projection *b*, on the rod *c*, when the handle *d*, is pulled up, and thereby the long end of the lever is raised, and the valve of the supply-cock opened. Immediately that the handle is released, the rod *c*, is drawn down again by its weight *e*; but the descent of the lever *a*, is retarded by the following apparatus:—*f*, is a cylindrical vessel containing water; and *g*, is a piston, which is made somewhat smaller in diameter than the vessel *f*, so as to admit of the water flowing slowly between them, and is also furnished with a valve that opens downwards, in opposition to the spring *h*,—such valve consisting of a disc, which covers several apertures in the piston. On the piston being raised, by pulling up the handle *d*, the water will open the valve and flow freely through the apertures in the piston; but when the piston is caused to descend, by the action of the weight *i*, (on the handle being released) the valve closes, and the water can then only flow between the edge of the piston and the inner surface of the vessel *f*,—the speed of such flow depending on the space left between the piston and the vessel, which will be increased or diminished according as it is desired that more or less water shall flow into the pan of the water-closet.

Instead of the vessel *f*, containing water, other fluids may be employed; but the patentee believes that it will be best to use water or air. With air, it is preferred to employ a flexible bag, although a cylinder and piston may be used. Fig. 2, represents a wash-hand basin, fitted with regulating apparatus, in which air is substituted for water. *j*, is a flexible bag, of India-rubber cloth, or other suitable material, connected at top to a disc *k*, which has a small hole in it, for the slow escape of air; and, at the bottom, it is secured to the lower part of the vessel *f*, and is furnished with a valve that opens inwards. When the handle *d*, is pulled up (in order to lift the end of the lever *a*, and so open the valve of the supply-cock) the disc *k*, is raised, extending the bag, and the air rushes in through the valve at the bottom. On the handle being released, the weight *i*, will depress the disc *k*, and the air will flow through the small hole in it,—the size of such hole regulating the time of descent, and, consequently, the quantity of water delivered into the basin. *l*, is the waste water-pipe, and *m*, the handle for opening the cock of the same. The hand-basin may have two sets of regulating apparatus—one for hot and the other for cold water.

Fig. 3, is a vertical section of a cock or tap, constructed according to the second part of this invention. The form of the cock may be varied,—the peculiarity consisting in the mode of combining two valves with a tube or cylinder, and

with the arrangement of the valve-seats, as shewn. *n, o,* are the two valves, placed upon a cylinder or tube *p,* to the lower end of which a guide-spindle *r,* is affixed, by means of an arch-piece *s,* and to the upper part a spindle *t,* is attached by an arch-piece *u.* *v, w,* are the valve-seats. The valves and tube may be raised and lowered by the means shewn, or otherwise; and the valves may be in equilibrium, or they may be made in such a manner that a somewhat greater pressure may take place on one than on the other.

Figs. 4, and 5, are vertical sections of two ball or float-cocks, constructed according to the third part of this invention. In fig. 4, the valve is in a state of equilibrium, by reason of the flexible part *x,* being attached to the spindle *y,* to which the valve *z,* is affixed. The valve is opened and closed by the float-lever z^1. The peculiarity of this ball or float-cock consists in the mode of combining the valve *z,* flexible part *x,* and lever z^1. In fig. 5, *a,* is a flexible tube of vulcanized India-rubber, fixed to the spindle *b,* and also to the cover *c,* so as to render those parts fluid-tight,—the part b^1, of the valve-spindle acting to obtain a counter-pressure to the valve *d.* *e,* is the float-lever, and *f,* the valve-seat. The peculiarity of this ball or float-cock consists in the mode of combining the parts *a, b,* b^1, and *f.* The cock exhibited at fig. 4, opens with, and that shewn at fig. 5, against, the flow of the water; but cocks may be made, on each plan, to open in the reverse direction to that shewn.

The patentee claims, First,—the mode of regulating the supply of water to water-closets and wash-hand basins. Secondly,—the mode of combining the parts of cocks or taps described in respect to fig. 3. Thirdly,—the mode of combining the parts of ball or float-cocks or valves described in respect to figs. 4, and 5.—[*Inrolled September,* 1852.]

To ALFRED VINCENT NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of printing surfaces,—being a communication.*—[Sealed 1st May, 1852.]

THE first part of this invention relates to the production of printing plates by moulding and pressing in moulds, having the characters, figures, &c., in reverse; which plates, whilst they present a surface of the requisite hardness, shall, at the same time, be sufficiently elastic and pliable to admit of bending around the periphery of the cylinder of a printing-

press. For the purposes of letter-press printing, the only practical modes which have been hitherto devised are, the form of separate types and the metal plates called stereotypes. The former of these is not well adapted to printing by what is known as the cylinder-press, for the reason that the types are quadrangular prisms, the sides of which, when the form is arranged on the periphery of a cylinder, do not coincide with the radii of the circle; and hence it is difficult to hold them firmly on the cylinder; and, even when held in place, they do not all stand in a position perfectly perpendicular to the axis of the cylinder. The other mode is objectionable on account of the expense and the length of time required for manufacturing stereotype plates; and, besides this, a plate, such as is used in stereotyping, could not be bent to give the required curvature to fit the cylinder, and leave the surface in a proper condition for printing. To obviate all the objections to the methods heretofore suggested is the object of the first part of the present invention, which consists in producing plates of letters, signs, figures, &c., arranged in any suitable manner, by moulding or pressing a substance or compound, whilst in the plastic state, so as to receive from the mould the configuration, letters, signs, figures, &c., required, and then permitting such substance or compound to become sufficiently hard to resist the force required for giving the impressions by a press, but still so elastic and pliable as to admit of being bent around the cylinder of a press.

The second part of this invention relates to the making of elastic printing plates for printing on irregular or smooth but hard surfaces, such as glass, wood, oil-cloth, and a variety of other surfaces; and it consists in producing such printing plates by moulding or pressing in suitable moulds, having the letters or figures, &c., in reverse, some highly elastic substance or compound (such, for instance, as that used for making the inking-rollers of printing-presses), whilst such substance or compound is in a heated and plastic state; so that, when cooled, such substance will be permanently elastic, and retain the letters or figures sufficiently to give impressions with any of the known kinds of printing-ink and other colors.

The inventor has given the following description of the mode of procedure which he has tried with success:—He takes, by weight, from 2 to 3 parts of gutta-percha, or from 2 to 3 parts of India-rubber or caoutchouc, and from 1 to 3 parts of finely-pulverized graphite, or soapstone, or plaster of Paris, or peroxide of manganese, and by grinding or otherwise, in a heated state, he thoroughly mixes them together,

as in the manufacture of the usual compounds of gutta-percha and India-rubber. He then takes a mould, made of the same material or other suitable substance, having the impressions in reverse of those intended to be produced, and obtained, if desired, from the usual form of types; and, having heated the gutta-percha or India-rubber compound, so as to have it in a plastic state, and rubbed or otherwise coated the surface with finely-pulverized graphite or its equivalent, to prevent adhesion, he introduces the compound, prepared as above specified, and forces or otherwise presses it into the mould, so as to procure an accurate impression thereof,—taking care to have the plate of the required and uniform thickness. The plate, thus moulded, is then permitted to cool and acquire the required consistency. When thus produced, it will be found to possess sufficient hardness or stiffness to give good and sharp impressions, and, at the same time, admit of being bent around a cylinder, so as to take the perfect cylindrical form. The angles and lines of the figures or characters will be found as perfect as if moulded from molten metal, and in all respects as suitable for the purpose. After such plates have been completely worn out, or otherwise put out of use, the substance can be softened again by heat, so as to be remoulded.

The substance which the inventor has tried with success, for the purpose of printing upon hard irregular surfaces, is a compound, consisting of the best kind of cooper's glue (as it is known in the arts) and molasses. Having made the required impression of the types or other figures in a gutta-percha or other suitable mould, he takes the compound of molasses and glue, mixed in the proportions and manner adopted in the manufacture of inking-rollers for printing-presses, and, while in a liquid state, he pours this mixture into the mould. When cold, it is removed therefrom, and the surface will then be found to have taken a complete impression of the mould, with all the characters in relief. The substance thus produced will be found to be highly elastic, and to hold and impart any of the known kinds of printers' ink; and, from its elasticity, impressions can be made on irregular and uneven or smooth but hard surfaces with facility. The figures or characters in relief should be raised to a greater extent than in making stereotype plates of metal, particularly when intended for printing on very uneven surfaces. The said plates can be made to vary in the degree of elastic tension, by varying the relative proportions of the glue and molasses.

The patentee claims the making, from flat moulds, of plates (from which to take impressions by a cylinder press) of a substance which, when heated, will be sufficiently plastic to receive the required impression by moulding in a mould of the required form in reverse, and, when cooled, will be sufficiently hard to give the required impressions in a cylinder press, and admit of being bent around and fitted to a cylinder substantially as specified; and also the application of such plates or printing surfaces to the cylinders of cylinder printing machines; and, finally, he claims the making, by casting in moulds, or by pressure, plates with raised characters or figures,—the entire substance of such plates being sufficiently elastic to adapt it to printing on hard or irregular surfaces, substantially as described.—[*Inrolled November*, 1852.]

Scientific Notices.

INSTITUTION OF CIVIL ENGINEERS.

March 1st, 1853.

The paper read was "*On the increased strength of cast-iron, produced by the use of improved coke,*" by Mr. W. FAIRBAIRN, M. Inst. C.E.

The paper commenced with a communication from Mr. Crace-Calvert, on the subject of an improved system of depriving the fuel, whether used in blast furnaces or in re-melting cupolas, of the deleterious substances by which the quality of the iron was deteriorated, and of the adaptation of the system to blast furnaces, when using coal for smelting iron ores.

The object was chiefly to point out what were believed to be the causes of the inferiority of iron, in many works, apart from the varying qualities of the ores. These were stated to be the introduction and application of the hot blast, which had enabled the iron-master to reduce into cast and malleable iron, a very large per-centage of cinders, slag, and other impurities, containing large proportions of silicate of iron, sulphur, and phosphorus, all of which tended to destroy the tenacity of the metal, and to render it either "red short" or "cold short." Sufficient attention was not devoted by those who were intrusted with the regulation and charging of the blast furnaces, to the chemical composition of the ironstone, by which the relative proportions of the flux and fuel employed in its reduction should be regulated. The chemical composition of the limestone or the coal was not sufficiently known,—these materials often varying in quality as much as the ironstone itself; and the iron smelter was unable to tell, with certainty, the quality of iron which his furnace would produce.

Instances had occured, where a siliceous ore had been used for three or four hours successively, and then at once it had been replaced by an aluminous and sometimes by a calcareous ironstone, without the change being made in the proportions of limestone or coal, which was evidently required by the different qualities of those ores.

The following analysis exhibited the different quantities of silicium existing in cast-iron :—

White Crude.	Monkland.	Coltness.	Eglinton.	Dalmellington.
0·18	1·53	2·69	3·12	4·42

The injurious action which an impure fuel had upon the quality of the iron was particularity alluded to; and the necessity of removing the sulphur from the coal or coke, when employed in the blast furnaces, before it could be imparted to the cast-iron during the process of smelting, was strongly enforced. The difference in the quality of iron smelted with coal, and by the application of a process which had been recently introduced by Mr. Crace-Calvert, compared with iron smelted in the ordinary way, was exhibited in the following analysis :—

PROPORTIONS OF SULPHUR.

Eglinton Pig Iron.	Melted in the Cupola with ordinary Coke.	Melted with improved Coke.
0·336	0·281	0·191

The following table shewed the improved quality of iron, after the application of the chloride of sodium in the blast furnace, by which the proportion of sulphur had been diminished.

Monkland without chloride.	Monkland with chloride.	Dalmellington without chloride.	Dalmellington with chloride.
0·390	0·150	0·956	0·218

And the increased bearing weight of 1 inch bars, cast from these irons :—

579°	627°	487°	556°
576°	655°	456°	525°
		487°	544°
		470°	562°
			569°

These improvements were described to have been effected at a very small cost by the following simple process :—If the blast

furnace was worked entirely with coal, chloride of sodium was added with each charge, in proportion to the quality of the ore and flux employed; but a better result was produced, if the coal was previously converted into coke, and an excess of the chloride was used in its preparation, in order to act on the sulphur of the coal and of the ore, should any be found therein; and a greater improvement was manifested in the quality of the iron, when only coke so prepared was used in the blast furnace. The coke, so purified, emitted no sulphurous fumes, when taken out of the coke oven; nor, when extinguished with water, did it give off the unpleasant odour of sulphuretted hydrogen; nor was there any sulphurous acid gas liberated during the operation of smelting iron in the cupola, or in raising steam in the locomotive boiler, by coke so prepared; and it was stated, that these decided advantages were gained, in some cases, at an additional cost of only one penny per ton of fuel.

The chemical action of the chloride of sodium was thus described:—When coal was first subjected to heat in a coke oven, the bisulphuret of iron contained in the coal was decomposed into sulphur, which was distilled or burned, and also into protosulphuret of iron, which remained in the mass, and was acted upon by the chloride of sodium, as it was volatilized at a red heat: thus chloride of iron and protosulphuret of sodium were produced. Then a second chemical reaction ensued,—the protochloride of iron was decomposed into a sub-perchloride of iron, and the chlorine gas thus liberated reacted on the sulphuret of sodium, giving rise to chloride of sodium and to chloride of sulphur, which latter was disengaged—so that the prepared coke contained less sulphur than the ordinary coke. But admitting even that a small portion remained, it would be in the state of sulphuret of sodium, which would not yield any of its sulphur during combustion, but would pass into the cinders of the blast furnace or of the cupola, and into the ashes of the fire-box in the locomotive,—thus preventing the injurious effects of the sulphur on the fire-bars and the copper of the fire-box, and on the brass tubes of the boiler of the locomotive; and the sulphur thus fixed did not enter into combination with the iron, preventing crystallization during the process of smelting, and giving greater tenacity and closeness of texture both to the cast and malleable iron.

The second part of the paper gave the results of a series of experiments which had been made by Mr. Fairbairn upon trial bars one inch square, cast from iron melted in the cupola with coke prepared by the process of Mr. Crace-Calvert. Specimens of the iron so prepared were exhibited, when the closeness of texture and the absence of the "honey-comb" appearance, prevailing in the iron cast with the ordinary coke, was clearly demonstrated. The mode of experimenting was described, and the results were given very elaborately; and it was shewn, that the average increase of strength was from 10 to 20 per cent.

Taking the mean of the whole experiments, the following conclusions were arrived at:—

	lbs.
The mean breaking weight of the bars per square inch, melted with the improved coke, was	515·5
Ditto ditto with ordinary coke	427·0
	=88·5

in favor of the castings produced from the improved coke, or in the ratio of 5 : 4.

The experiments on the bars smelted with the improved coke, indicated iron of a high order as to strength, and might be considered equal to the strongest cold blast iron: the metal appeared to have run exceedingly close, and exhibited a compact granulated structure with a light grey color.

March 8th.

The paper read was, "*Experimental investigation of the principles of locomotive boilers,*" by Mr. D.K. Clark.

The paper commenced with some historical facts in locomotive progress; shewing that the general design of the locomotive was matured immediately after the trials on the Liverpool and Manchester Railway in 1829—combining the multitubular horizontal boiler, the horizontal cylinders, and the blast pipe. Reference was made to the various systems practised in working out the general design, and to the necessity for fixed principles in proportioning the locomotive to the work for which it was destined. For the proper discussion of the question, it was indispensable to distinguish the three elements of the machine—the boiler, the engine, and the carriage; and to consider them separately, with respect to their proper functions; as the mixing up of one with the other had caused much of the confusion with which many of the recent discussions on the subject had been invested.

The paper was chiefly devoted to the discussion of the physiological principles of locomotive boilers. It was argued, that the combustion of coke in the fire-box was, in practice, very completely effected; that it was quite independent of the strength of the draft,—being equally complete with fast and slow drafts; that expedients for improving the combustion were superfluous; and that the combustion of coal might also, in practice, be perfected by a judicious use of the ashpan, damper, and fire-door. The evaporation of 12 lbs. of water, per pound of pure coke, was found, by careful laboratory experiments, to be the maximum evaporative performance; in the best ordinary practice, an actual evaporation of 9 lbs. of water per pound of coke, or 75 per cent. of the possible maximum, was readily obtained,—the balance being lost by leakage of air and by waste; and it was adopted, by the author, as the ordinary standard of practical economical evaporation.

It was shewn, by numerous examples, that the question of the relative value of fire-box and tube surface was of no practical importance, as the efficiency of boilers was not sensibly affected by their relative amounts—that the superiority of fire-box surface was due, merely to its greater proximity to the fire—and that the distinction of radiant and communicated heat was merely circumstantial; that what was gained in radiant heat, was lost in communicated heat; and that whether it was all radiating, or all communicated, mattered not to the total efficiency of the fuel. On these grounds, the author regarded, with indifference, the use of such expedients as extended fire-boxes, midfeathers, corrugated plates, and combustion-chambers; and it was asserted, that where the addition of midfeathers had been found advantageous, there had been a deficiency or bad arrangement of the tube-surface.

A minute analysis was made of the results of numerous authenticated experiments on the evaporative power of locomotive boilers, of very various proportions, comprising several made by the author on the engines of the Caledonian, Edinburgh and Glasgow, and Glasgow and South Western Railways. It was concluded, that the economical evaporative power of boilers was materially affected by the area of the fire-grate, and by its ratio to the whole heating surface—that an enlargement of the grate had the effect of reducing the economical evaporative power; not necessarily affecting the quality of combustion in any way, but governing the absorbing power of the boiler; as the lower rate of combustion, per foot of grate, due to a larger area, in burning the same total quantity of fuel per hour, was accompanied by a reduced intensity of combustion, and by a less rapid transmission of heat to the water; in consequence of which, a greater quantity of unabsorbed heat must escape by the chimney. An increase of heating surface, again, reduced the waste of heat, promoted economy of fuel, and added greatly to the economical evaporative power. In short, the question resolved itself into the mutual adjustment of three elements:—the necessary rate of evaporation, the grate-area, and the heating surface, consistent with the economical generation of steam, at the assumed practical standard rate of 9 lbs. of water per pound of good coke. An investigation of the cases of economical evaporation in the table of experiments, conducted the author to the following very important equation, expressing the relation of the three elements of boiler power; in which c, was the maximum economical evaporation in feet of water per foot of grate per hour; h, was the total heating surface in square feet, measured inside; and g, was the grate-area in square feet:—

$$c = \cdot 00222 \frac{h^2}{g}$$

From this it followed:—1st. That the economical evaporative power decreased directly as the area of grate was increased, even while the heating surface remained the same; 2nd. That it increased directly as the square of the heating surface, when the

grate remained the same; 3rd. That the necessary heating surface increased only as the square-root of the economical evaporative power; 4th. That the heating surface must be increased as the square-root of the grate-area, for a given economical evaporative power. It was contended thence, that the heating surface would be economically weakened by an extension of the grate, and would be strengthened by its reduction; and that whereas large grates were commonly thought to be an unmixed good, and, being generally recommended, were usually adopted; still they might be made too large,—not that their extension affected the quality of combustion, but that the economical evaporative power might be reduced. Concentrated and rapid combustion was, alike, the true practice for the largest and smallest boilers; and in locomotives, where lightness, compactness, and efficiency were primary objects, the boilers should be designed for the highest average rates of evaporation per foot of grate, that might be followed consistently with the highest average rate at which coke could be properly consumed; as in this manner, the smallest grate and the smallest amount of heating surface, consistent with good practice, might be employed. It was stated that 150 lbs. to 160 lbs. of good sound coke could be consumed per foot of grate per hour; and, allowing for inferior fuel, an average maximum of 112 lbs. per foot of grate per hour was recommended as a general datum. This determined the average maximum of economical evaporation to be 16 feet of water per foot of grate per hour—allowing 9 lbs. of water per pound of coke; for which, 85 feet of heating surface per foot of grate should be provided. It was accordingly recommended, that a heating surface, at least 85 times the grate-area, should be adopted in practice.

It was also shewn, by examples of inferior economy of evaporation, that the clearance between the tubes, for the circulation of water and steam, was in many boilers much too small—that the clearance should be in proportion to the number of tubes—and that, for good practice, a clearance at the rate of $\frac{1}{8}$ inch for every 30 tubes should be allowed.

The author supplied several practical rules deduced from this examination, and stated his conviction, that the deductions from his experience with locomotive boilers were in the main applicable to all other forms of boiler. He applied the rules to several conspicuous examples of locomotive boilers of the present day, and endeavoured to shew in what respects they were defective; he also suggested simple means of rectifying them, and of improving their action; and he alluded to the long boiler of Stephenson, as affording the best example of combined lightness, compactness, and evaporative power.

The author finally referred to his practical investigations on the subject of the blast-pipe. From these he concluded that, in all practical cases, the blast-pipe was susceptible—by a correct adjustment of the details of the boiler—of being made abundantly wide enough, consistently with the demands for steam, to afford

a free and sufficient exhaust at all speeds, so as practically to remove all back pressure by imperfect exhaustion.

After the meeting, Mr. Hulford, of H.M. Dockyard, Woolwich, exhibited an ingenious instrument of his invention, for ascertaining, from an indicator card, the steam pressure on the piston of a steam-engine. The indicator card being placed on the board, so that the atmospheric line coincided with the marks on the retaining springs, a triangular scale was placed at the bottom of the figure, and a side roller made to revolve, until the spiral line on it intersected the edge of the scale, in which position the roller was fixed. The distances between the steam and vacuum lines were taken by sliding the scale along the figure; and ten or twenty divisions might be taken, according to the degree of accuracy required: the sum of the distances divided by their number gave the mean pressure on the piston.

March 15th and 22nd.

Both evenings were entirely devoted to the discussion of Mr. D. K. Clark's paper "*On locomotive boilers.*"

The proceedings were commenced by an explanation of the diagrams exhibited, and by reference to examples, from the experience of De Pambour, and other experimentalists, in corroboration of the views propounded in the paper.

The author's deductions were admitted, as to the practical identity of fire-box and tube surface, for evaporating action, and as to the constancy of the evaporative efficiency of fuel—whether by radiant or communicated heat, or both together, or whether the draft was mild or strong. It was considered, that heat was specific and certain in its effects. Such expedients as mid-feathers, &c., which were resorted to for specially increasing the fire-box surface, were condemned; as they were considered to be no better than tubes, whilst, practically, they were inconvenient and costly; and as, among other reasons, plates of $\frac{7}{16}$ths, or $\frac{1}{2}$ inch in thickness were employed to do the work of the tubes, which were less than $\frac{1}{8}$th inch in thickness.

A practical rule, followed by some engineers, was to allow 5 feet of heating surface for 1 foot of water evaporated per hour, and 100 feet of evaporating surface per square foot of grate. Those results were found to agree with the maximum rates recommended in the paper. It was also argued, that the intensity of combustion materially affected the amount of heating surface necessary for economical evaporation,—being less as the intensity was greater. It was, on the other hand, contended, that the formula, as stated in the paper, would not apply to all engines; and the following table of actual results was given, shewing the performance of various engines, several of which exhibited a greater and others a less evaporation of water and consumption of coke, per square foot of grate surface, per hour, than the formula would have given.

ACTUAL WORKING RESULTS OF ENGINES, COMPARED WITH DEDUCTIONS BY THE FORMULA.

Name or No. of Engine.	Total Heating Surface.	Total Firegrate Surface.	No. of Carriages.	Speed per Hour.	Actual Evaporation per Sq. Ft. per Hour.	Evaporation by Clark's Formula.	Actual Coke Consumption per Sq. Ft. per Hour.	Coke Consumption by Clark's Formula.	Per Centage of Difference in Water.	Per Centage of Difference in Coke.	Date, and Name of Observer.
234	1125	14·32	12·3	26·5	5·41	16·05	44·9	126·3	180	188	From March 10th to 12th, both inclusive— Mr. Alexander.
291 1st Experiment	1325·8	18·8	9	42·1	4·72	11·04	40·8	116·5	175	190	24 February— Mr. Forsyth.
291 2nd Experiment	1325·8	18·8	17	38	5·12	11·04	58·43	102·7	120	76	7 March— Mr. Alexander.
300	1133·21	23·5	34	36·4	8·21	5·16	65·5	40·37	60	62	8 March— Mr. Forsyth.
Rocket— 1st Experiment	707	10·6	9	42·1	8·99	9·89	78·4	86·2	12	10	24 February— Mr. Alexander.
Rocket— 2nd Experiment	707	10·6	13	34·5	11·9	9·89	102·3	84·4	22	21	25 February— Mr. Alexander.
Heron & Prince of Wales	707·54	10·6	34	34·5	10·68	9·89	72·1	73·7	11	10	8 March— Mr. Alexander.

As an example of the objections to long tubes, the results were given of the work done by a luggage engine on the London and North Western Railway, before and after alteration. That engine originally had tubes 14 feet long, with a total surface of upwards of 800 feet; the length of the tubes was diminished to 4 feet 9 inches, and the total surface was reduced to about 500 feet; and then it was found that a saving in fuel of 40 per cent. per ton per mile moved, was produced, with a saving of 23 per cent. per mile run;—the coke used per ton per mile, with long tubes, before alteration, being ·504 lbs., and with the short tubes, ·298 lbs. The back pressure was contended to be a serious drawback to the long tube engine; and an example was given of a trial of a single engine, on the new plan, against two of the ordinary kind, with a load of 170 tons in both cases; and although the single engine was 43 per cent. less powerful than the two engines together, and had 20 per cent. less heating surface, yet it had performed the same distance, 111 miles, in ten minutes less time, and with 3 lbs. per mile less fuel. This, it was argued, was owing to the engine exerting a greater dynamic force, by being relieved from the back pressure of the blast pipe, which in the case of the other two was applied to force the fire, and to draw the heated air through the long tubes. By the mode of placing the tube plate some distance within the cylindrical part of the boiler, the tubes were not liable to be choked with cinders, or the draft to be obstructed. This plan also afforded an opportunity of reducing the size of the tubes from $1\frac{3}{4}$ inch diameter to $1\frac{3}{8}$ inch, giving in the same boiler an equal area of flue passage, whilst, at the same time, the proportion of tube heating surface was increased 34 per cent. per foot of length of tube, and a very large addition of flame surface was gained.

It was further argued, that although the evaporation of water per lb. of fuel was the test of the boiler, yet up to this time few, if any, experiments could be implicitly relied on,—owing to the quantities being estimated by measurement instead of by weight, and without due regard to the variation of the temperature of the water in the tender. As to the evaporative powers of marine boilers, compared with that of the best locomotive boilers—if an investigation was instituted, it would be found that the general features of the best tubular marine boilers now used in ocean navigation were nearly identical with those of locomotive boilers; but the circumstances under which they were used were very different. In the marine boilers, coal was used instead of coke, and the natural draft of the chimney instead of the urging of the blast-pipe in a locomotive; salt water was also used instead of fresh water, and a pressure of about 12 lbs. or 14 lbs., instead of from 60 lbs. to 80 lbs. on the square inch.

The following statement shewed the comparative proportions and effect of the two descriptions of boilers:—

In the Locomotive Boiler.	In the Marine Boiler.
1 square foot of firegrate consumed about 112 lbs. of coke per hour.	1 square foot of firegrate consumed about 20 lbs. of coal per hour.
1 square foot of firegrate required about 85 square feet of fire-box and tube surface.	1 square foot of firegrate required about 30 square feet of fireplace and tube surface.
1 square foot of firegrate with the above surface, would evaporate 1008 lbs. of water per hour	1 square foot of firegrate with the above surface, would evaporate 170 lbs. of water per hour.
1 square foot of flue surface would evaporate 11·7 lbs. of water per hour.	1 square foot of flue surface would evaporate 5·66 lbs. of water per hour.
1 lb. of coke would evaporate 9 lbs. of water.	1 lb. of coal would evaporate 8·5 lbs. of water.
1 H. P. of 33,000 lbs. lifted 1 foot high per minute, required about 4 lbs. of coke per hour.	1 H. P. of 33,000 lbs. lifted 1 foot high per minute, required about 4·25 lbs. of coal per hour.

From this statement it appeared, that although the proportion between the fire-grate and the flue surfaces was widely different, the quantity of water evaporated and the power obtained by the consumption of a given weight of fuel, were nearly the same, when allowance was made for the difference in the evaporative power of coal and coke.

After explaining the table of "working results," &c., it was contended that in no case did the formula accord entirely with the practical results recorded in the table;—the nearest approximation being that of the "Rocket."

It had been found, in the altered goods-engine, that certain practical inconveniences arose from the horizontal transverse water tubes; and two or three midfeathers had now been substituted for them. Intense combustion was liable to cause the formation of clinkers in the small fire-box, which did not occur in the new engine. When the drivers first took out the new engine, being unaccustomed to its peculiar action, they kept thin fires, and drew too much air through the fuel, which was wasted, by raising steam too freely: latterly, the fires had been kept thicker, and the combustion had been slower, whilst the supply of steam had been fully equal to all demands upon the engine, which, it should be recollected, had been built expressly for conveying heavy loads at high speeds; and whose performances, under these circumstances, were contended to have been among the best recorded results of the present day.

The possible maximum evaporative power of 1 lb. of carbon, was deduced from the results of chemical experiments, shewing,

that 1 lb. of carbon, converted into carbonic acid, developed 14,000 units of heat, or would raise 14,000lbs. of water through 1°, which was equivalent to the conversion of 12lbs. of water at 60°, into steam of 120 lbs.

It was explained, that the formula referred to the economical evaporative power of boilers, and that it was in no way designed to limit the unconditional evaporative power—that a boiler might raise less or more steam than the quantity assigned by the formula, but in the latter case, only by a partial sacrifice of the fuel.

In the comparative trials of the Crewe engines and the new engine with enlarged fire-box, it was shewn, that looking simply to the boilers, the Crewe boilers evaporated a greater total quantity of water per hour, and more water, per foot of grate, per hour, than the new boiler, with greater economy, in the ratio of 8¼lbs. per lb. of coke by the Crewe boiler, to 7¾lbs. by the new boiler. It was explained, with respect to the greater time lost by the Crewe engines on the trial, that the defect lay, not in the boilers, but in the exposed position and unprotected state of the cylinders, by which steam was condensed, and in the too large size of the chimneys, which should have been only 12 inches, instead of 15 inches diameter, and in the blast pipe, which was carried too far into the chimney.

The formula being applied to the new boiler, indicated that it could not, economically, evaporate above 120 cubic feet of water per hour; and the correctness of this indication was confirmed by the result of eighteen experiments by Mr. Marshall; as they shewed that though 150 feet of water per hour had been evaporated, it was at a sacrifice of one-fourth of the fuel, as only 7½lbs. were evaporated per pound of coke. With respect to the rapidity with which the new form of boiler could get up the steam, and which was attributed to the free draft, it was shewn, that the Rocket, the first tube-boiler engine ever made, got up the steam in less time than the new boiler. The benefit of the removal of the tube-ends in the new boiler from the direct action of the fire, was considered to be more than balanced by the liability of the lower part of the combustion-chamber to become over-heated and to be burned away, owing to the lodging of steam at the junction with the fire-box. It was suggested, that in order to obtain better results from the new engine, the combustion-chamber should be abolished, the number of the tubes should be reduced, and their length be extended to the fire-box, which should be restricted to 16 square feet of area. It was further argued, that in the statement of "Actual Working Results, &c.," the formula had been misunderstood and wrongly applied; for instance, in the two Crewe engines, of identical proportions, the results of the formula were stated as 86·2, 84·4, and 73·7; whereas the same results ought to have been applied to each. In No. 291 engine, a similar discrepancy was apparent,—the results being 116·5 and

102·7. In the experiments themselves there were several unexplained anomalies; and in some instances, the engines, instead of working at their full power, were performing very inadequate duty, and therefore under circumstances to which the formula was not intended to apply.

In the case of the altered goods engine, No. 125, it was urged that, in its original state, the engine must either have been in a very inefficient condition, or that its duty must have been chiefly confined to piloting, when it would have been consuming the fuel without producing any useful effect; as a consumption of 51 lbs. or 58 lbs. per mile run, with an average train of 115 tons, was out of all proportion. That the result of the working, after alteration, viz., a consumption of 39 lbs. and 43 lbs. per mile run, with a load of 144 tons, was not favorable; as compared with the performance of a narrow gauge engine, reported on by Mr. D. Gooch, in the "gauge inquiry"—where, with a consumption of 47 lbs. per mile, a load of 294 tons was conveyed; and also, when compared with the working of the Eastern Counties goods engines, for the last half year,—where, with an average load exceeding 170 tons, the consumption of coke was only 32 lbs. per mile—taken over a distance of 529,000 miles.

A comparison was drawn between the recent experiments, by Mr. Marshall, on the large fire-box engine, and those on the long-boiler engine, made during the gauge inquiry,—the results being, with the former, a consumption of 40 lbs. per mile, with an average load of 64 tons, and with the latter, a consumption of 27 lbs. per mile, with a load of nearly 60 tons. The recorded results of the work of the passenger trains, on the Eastern Counties line, for the last half year, shewed an average consumption of coke under 18 lbs. per mile run.

As to mid-feathers, it was contended, they had hitherto only served to extend the dimensions of the fire-box, and to increase the difficulties of maintaining and repairing the boiler; and that, up to the present time, the results of the experiments upon the boiler with enlarged fire-box and shortened tubes, exhibited rather a retrograde step than an onward progressive movement.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

THE Sixth Annual General Meeting of the Members was held at the house of the Institution, Newhall-street, Birmingham, on Wednesday, January 26th, 1853, ROBERT STEPHENSON, Esq., M.P., President, in the Chair.

After the reading of the Annual Report of the Council, wherein the progress and future prospects of the Institution were set forth,

the following paper, by Mr. John McConochie, of Wednesbury, was read:—

On an improved railway chair.

The consideration of the best means of increasing the durability of rails and chairs has received much attention of late from practical engineers; the subject having been brought more prominently into notice by the wear and tear that takes place in this portion of railway plant; the double-headed rails becoming in some places unfit for use within five or six years from the time they are laid down. This speedy deterioration seems mainly to arise from the insufficiency of the common description of chair; which is proved by the thousands of tons of rails that are now being returned into different works as old iron, with the bottom head almost as sound as when rolled, except having indentations every three feet where the chairs have been fixed;—the rails being thus so much damaged as to be unfit for reversing, according to the original intention. Such being the case, it proves the importance of using some description of chair that will support and secure the rail without injury to its durability; and the subject of the present paper is an improved railway chair, which it is believed will meet this requirement, and increase the durability of the rails from 25 to 50 per cent.

In Plate VIII., fig. 1, is a side view and fig. 2, an end view of a joint-chair on the improved plan, as supplied to the Liverpool, Crosby, and Southport Railway. It consists of two parts, the body of the chair A, and the abutment-piece B. The key C, is made of either wood or iron; but the former is preferred. A space D, of about ⅛th of an inch is left between the lower head of the rail and the sole of the chair. The fillet E, fits loosely into the groove cast in the abutment-piece, which prevents the possibility of its being driven out of the chair. The weight of the joint-chair here shewn is 35 lbs., and the weight of intermediate chairs for the same section of rail averages 26 lbs., which is not more than the weight of chairs of the ordinary description. When it is desirable to remove the rails, the operation is as follows:—The key C, is driven out, which allows the rail to rise vertically out of the chair, carrying with it the abutment-piece; so that the operation of turning the rail is performed as easily as when the common description of chair is used. In the latter, the support of the rail is entirely dependent on the wooden key; whereas the improved chair forms of itself a self-acting fastening for the rails, thereby offering considerable facilities for laying in, repairing, or relaying the road. Besides, as trains may pass over them immediately the rail is laid in, before keying up, it shews the comparative unimportant office the wooden key has to perform in these chairs, in comparison with those in ordinary chairs. In the latter, the keys require continual replacing and supervision, which forms a considerable item in the maintenance, both in superintendence and materials; while, in the improved chair, the

office of the wooden key is simply to lock the rail in the chair, thus forming a more complete bond between the rail and the sleeper. It may be observed, at the same time, that several of these chairs have now been in use three or four months without any keys;—the lateral force of the abutment-piece serving to some extent as a key to them. This point of superiority of the improved chair over those in common use should not be overlooked; for if the keys in the latter are omitted or get loose and work out, it is to the peril of the trains that pass over them; while in the new chair it has been proved that such an omission is not attended with any danger, except under extraordinary circumstances, where there may be a liability of the earthwork slipping.

The prominent feature in the improved chair consists in its preserving the lower head of the rail from injury, while the upper one is in use, by supporting the rail as shewn in the drawing. The object being to obtain the maximum amount of wear out of a given quantity of material, by wearing down successively the top and bottom surfaces of the rails.

The durability of the rails greatly depends on the strength and steadiness of the fastenings, which is one of the advantages of this chair, from the fact of downward pressure tending to tighten its hold on the rail: this is an important point, as, theoretically, chairs, to be perfect, should be as tight to the rails as if they formed part of them. The fact of the ordinary chairs being an inefficient fastening, has led to the abandonment, in many instances, of the double-headed section of rail, notwithstanding its many advantages when used in combination with transverse sleepers. In the opinion of the writer, by the adoption of the present method of fishing at the joints, combined with better intermediate fastenings than the ordinary chair, the double-headed rail and transverse sleeper cannot fail to outlive all the expedients which have been resorted to of late years to supersede this construction of permanent way. The ordinary fastenings are loosened and deteriorated principally by the alternate upward, downward, and lateral pressure, from the deflexion of the rails between the supports. In the improved chair, the combined action of the key and abutment-piece prevents this injurious action going on, as in the ordinary chair, in the comparative ratios of from 50 to 100 per cent., according to the different weights applied.

With the ordinary chair, the tendency of the rail to get bent and crooked operates very materially to lessen its durability; for, in some instances, even if the lower head were not notched, it would not be fit to reverse unless straightened, and the fibres consequently disturbed, &c.; but, with the improved chair, the liability to get bent is greatly lessened by the additional stiffness these chairs give to the rail. To secure a more uniform road and prevent the possibility of the joint-chair canting, it is recommended that a sleeper be laid lengthways underneath the joint-chair, as shewn at F, in fig 3.

A modification of the improved chair is shewn at fig. 4. It presents more bearing surface to the rail than any other joint-chair in use: consequently it greatly strengthens the rail at the joint. It differs from the chair already described, in having two abutment-pieces instead of one, which are made fast by wrought-iron keys, as shewn at G. When the keys are backed, the rail can be lifted vertically out of the chair.

The results of some experiments made some time back, by Mr. James Samuel, upon the rails of the Eastern Counties Railway, by interposing gold-leaf between the rail and the chair, shewed that the amount of surface in contact between the rail and the ordinary intermediate chair was $1\frac{1}{2}$ square inches. This appears a liberal calculation; but if we take it as an approximation, it gives a result of rather more than 6 to 1 in favor of the improved chair; for as the two jaws of the chair are equal unitedly to 12 inches in length, and as the width in contact with the neck of the rail may be taken at $\frac{3}{4}$ of an inch, the total bearing surface is 9 square inches, instead of $1\frac{1}{2}$ inches. Therefore, if we take the weight of an engine driving-wheel, hammering along at the rate of 30 or 40 miles an hour, to be equal to a force of nine tons, this would throw a pressure of 6 tons on the square inch on the $1\frac{1}{2}$ square inch of rail in contact with the sole of the common chair; but it would only amount to $1\frac{1}{4}$ tons per square inch on the under-side of the head of the rail in the improved chair; so that, while the former pressure is sufficient to indent the rail, the latter will probably prove quite harmless.

Objections have been raised to this chair on the ground that the tendency of the jaws will be to tear the head off the rail. This would be the case if the jaws were tapered to an edge, instead of being rounded to the same curve as the under-side of the head of the rail—the part in contact with it. With an edge, they would by degrees work their way into the head of the rail, until, lamination taking place, a separation of the top from the bottom part of the rail would ensue. The writer understands that something of this sort took place on the London and Birmingham Railway with some of the first chairs laid down on that line. In these chairs a portion of the weight was carried on the sole of the chair, as in ordinary chairs at the present time; but, in order to give greater support to the rail, the arm of the chair opposite the key bore right against the head of the rail. It was found, however, that as soon as the under head began to bed into the chair, the whole of the weight came on the top of the arm or side of the chair, against which arm it was backed up, though inefficiently, by the key on the other side of it; but the chair being only the same width as the common one, did not present much bearing-surface to the rail; and the weight then bearing on such a narrow surface caused the head of the rail to be indented and injured: consequently, the attempt to support the rail at these two points at the same time was abandoned.

The following are the principal advantages of this chair:—1st. The lower head of the rail is preserved free from injury, while the upper one is in use.—2nd. The abutment-piece, or loose jaw, forms a self-acting fastening.—3rd. The improved chair gives the rail great additional stiffness, vertically and laterally.—4th. The length of the jaws of the chairs causes the distance of unsupported rail, between chairs placed the usual distance apart, to be less than with those in ordinary use.—5th. This chair, by preventing the ends of the rails slipping, and securing level joints, lessens the wear and tear of the rolling stock, and promotes ease in travelling.—6th. The keys require much less attention, as their office is not to support the rail, as in the common chair, but only to keep it from rising in the chair.—7th. The above advantages are secured at a very slight extra expense on the first cost of the chair.

The following experiments were made with Mr. Marshall on these chairs:—

First Experiment.—The rail experimented upon was the same section as used on the Liverpool, Crosby, and Southport Railway, viz., 5 inches deep, and 2¼ inches broad in the head, by ⅝-inch thick in the web, and 72 lbs. per yard. One of these rails being placed in one of the improved intermediate chairs, as shewn at fig. 5, downward pressure was applied by the hydraulic ram H, at the points A, B, until the end of the abutment-piece in the chair cracked at C, through the deflection of the rail. On the rail being taken out, the permanent deflection was ⅝ of an inch in the 3 feet between the centre of the supports A, and B. The pressure when the end of the abutment-piece cracked was nearly 40 tons. While the rail was deflecting, the motion of the scale upon the surface of the rail was very conspicuous. The amount of deflection of the rail was the entire cause of the fracture of the abutment-piece.

Second Experiment.—The pressure was applied on a joint chair and two intermediate chairs, as shewn at fig. 6. The same experiment was then tried with common chairs instead of the improved chairs,—a line being drawn across in each case to gauge the deflection at D, and E.

The results are are shewn in the following table:—

Pressure.	Deflection with Improved Chair.	Deflection with Ordinary Chair.
Tons.	Inches.	Inches.
15	—	—
20	—	—
31	·01 (about)	·02 (about)
40	·07	·12
50	·12	·16
60	·14	·19
70	·16	·25

At 40 tons pressure, one of the outside chairs broke across the sole; but another being substituted for it, the experiment proceeded without interruption,—the result obtained being as stated above. The permanent lateral deflection with the improved chairs was $\frac{1}{8}$th inch, and with the ordinary chairs $\frac{5}{16}$th inch. These results were unexpectedly satisfactory, proving the superiority of the new chair over those in common use, by its adding to the stiffness of the rail, and increasing its capability to sustain weight. This may be accounted for by the improved chair holding the rails much tighter than the common chair; the side pressure of the abutment-pieces having the effect of tightening the rails in their chairs in proportion to the pressure applied; but with the common chair the effect of the pressure is to loosen the rails in the chairs. It is a well known fact, with respect to girders, that if two are made precisely alike in all particulars, and fixed in a building, the one with its ends made tight in the walls, while the ends of the other are left loose, merely resting on the wall, then, if the latter one is weighted till it breaks, the same weights may be placed on the former one with impunity, without any fracture taking place. From a similar reason, the new chairs add to the stiffness of the rails, and preserve them from deflecting laterally and vertically to the extent they do in the common chairs.

The object of the next and last experiment was to test the strength of the chair. The rail was put in an intermediate chair, and the pressure applied as at fig. 5. When the pressure reached 60 tons, the rail broke through in the centre of the chair, cracking off simultaneously the ends of the wedge, but without any other injury to the chair.

Mr. McConochie stated, in reply to a question from Mr. McConnell, that an angle of 45° was considered the best for the inclination of the wedge-piece in the chair, to distribute the strain most uniformly, vertically and horizontally: they had tried a more acute angle at first, and tested the strength of the chair by a heavy weight falling upon it, until it was broken. And, in answer to a question from the Chairman, he said that three or four miles of one line were laid with these chairs on the Liverpool, Crosby, and Southport Railway,—part of which had been laid five months. A few hundred yards had also been laid with them, for about three months, at the entrance to the Liverpool Station of the Lancashire and Yorkshire Railway, where there was a large traffic constantly working over them with heavy engines: the road was found to keep in better order with the improved chairs than with the ordinary ones, and was smoother to run upon; and nothing had been done to the chairs since they were first laid down.

The Chairman observed, that he remembered the circumstance alluded to in the paper of the chairs tried on the London and Birmingham Railway; but he had no recollection of the head of the rail being injured: the chairs had the effect of splitting the ends of the rails. His impression was, that the rail was entirely

suspended, not resting on the bottom, and the object was to steady the rail in the chair. The fracture took place in the centre of the web, spreading three or four inches lengthwise into the end of the rail. He then came to the conclusion that the best support for any girder is at the bottom of the under side, where the strain is simply compression of the material.

Mr. McConochie said he had tried the effect of reducing the thickness of the web of the rail at the ends, by planing off a portion on each side of some that were laid down, in order to test this point experimentally; but no signs of splitting were yet perceived, though, of course, such a tendency might not shew itself for a considerable time.

Mr. McConnell remarked, that the rail being gripped, as in a vice, by resting between the two inclined surfaces, there would only be compression upon the metal—not any force tending to draw and tear it asunder vertically.

The Chairman doubted whether any such grip of the chair could be considered practically to hold the rail under the hammering action of heavy engines running over it at speed.

Mr. Fothergill observed, that, with the sinking of the sleeper, the key would throw a cross strain upon the end of the rail, tending to split it from the length of leverage given by the grip of the chair upon the key and rail.

The Chairman remarked, that there would certainly be that strain; though it might be a question whether the actual amount of it was sufficient to cause an injurious effect. A long time was required before the effect on the rails was apparent in those alluded to on the London and Birmingham Railway: it was perhaps 1½ year before it became an extensive defect.

Mr. McConochie, in reply to Mr. McConnell, said, that the chairs were sand castings: they were found sufficiently accurate without being chilled.

Mr. E. A. Cowper asked whether any difficulty was found in getting a fair bearing for the rail on each side, by casting the chairs so that the two jaws should be an equal height?

Mr. McConochie answered, that it was found quite sufficient to leave the casting rather proud in the shoulder, so as to bear first in the neck of the rail, that the pressure might not come too much on the outer edges of the chair and wedge.

Mr. E. A. Cowper thought the deflection at the joint would cause a tendency to split the rail-end, and that fishing-pieces would be better, as they would throw a less proportion of strain upon the rail; a combination of the two, namely, fishing-pieces at the joint, with these chairs as intermediate chairs, would make a nearly perfect road.

Mr. McConochie, in answer to the Chairman, stated that the new chairs were about 28 lbs., and the common ones 25 lbs., on the Liverpool, Crosby, and Southport Railway. There was less deflection than with the ordinary chairs, nor was any inju-

rious strain perceptible. No failure of the chairs had occurred; on the contrary, the engineer of the line wanted to reduce the weight of the chairs to the 25 lbs. in future, though he, Mr. Mc Conochie, did not recommend any diminution in their weight.

Mr. S. Lloyd, jun., remarked, that as some rails on the Liverpool, Crosby, and Southport Line had been laid down with these chairs for five or six months, in which the web of the rail was only ½-inch thick, and as the opening pressure of the chairs on these rails had not been found to do them any injury, he did not see that these chairs could prove at all injurious where the common sections of rail were used, as in these the thickness of the web varied from ¾ to 1 inch.

Mr. Mc Conochie stated that his object in reducing the thickness of the web in the rails had not been so much to shew that the improved chair would answer with a lighter section of rail, as to construct a rail which, while no heavier than the ordinary rails, had a greater amount of available wearing surface. The metal taken out of the web he transferred to the head of the rail.

The following paper, by Mr. Edward A. Cowper, of London, was then read:—

Description of Cugnot's original invention of the locomotive steam-engine for common roads.

The object of the present paper is to put the members of this Institution in possession of certain information, which was obtained by the writer and the Secretary of the Institution, when in Paris, in reference to a locomotive steam-engine for common roads, which they saw in the *Conservatoire des Arts et Metiers.*

Attention was first drawn to the subject by a model of a locomotive on three wheels, placed in a glass case in the Conservatoire; and, on making enquiries, it appeared that the actual engine itself was preserved in an old church, which had been appropriated for the reception of various kinds of interesting machines, within the bounds of the Conservatoire. Permission to view the engine having been obtained, it was examined carefully, and general dimensions were taken. It was a most creditable piece of work, considering when it was made, and would no doubt have caused a much greater sensation in the world than it did, had it not met with a serious accident after it had been taken out for two or three little trips only. The officer who shewed the engine explained, that as it was passing along a street, near where the Madeleine now stands, in turning a corner it overbalanced itself, and fell over with a crash; and, unfortunately, instead of being allowed to get the better of the bruise, and have another trial, it was at once locked up, to keep it out of harm.

The following particulars have been translated from the French description, furnished by M. Armengaud, Professor at the *Conservatoire des Arts et Metiers.*

It appears from documents collected by M. Morin, that a native of Lorraine, in France, named Cugnot, is entitled to the credit of having first constructed a carriage whose wheels were propelled by steam, and that in 1769 he made a locomotive on three wheels, to run on common roads, which was put in motion by a steam-engine, composed of two single-acting cylinders, whose pistons acted alternately on the single front wheel. Nicholas Joseph Cugnot, whose name has been hitherto overlooked in the history of the locomotive steam-engine, was born at Void, in Lorraine, on 26th February, 1729, and died at Paris in 1804.

In the trials of Cugnot's machine, which were made at the Arsenal, in the presence of the Duke de Choiseul, then Minister of War, General Gribeauval, First Inspector-General of Artillery, and other eminent persons, the new vehicle, loaded with four persons, could not travel faster than 2¼ miles per hour; and the size of the boiler not being sufficient, it would not continue at work longer than 12 or 15 minutes; it was then necessary to wait until the steam had again risen to a sufficient pressure before it could proceed further.

In 1770, Cugnot constructed a new machine, which gave more satisfactory results; but the trials made by order of the Duke de Choiseul were however abandoned. The employment of steam-engines in the place of animals, to convey merchandise and passengers, could not become a practically successful application without the aid of the iron railways of England; and the difficulty of managing the machine on common roads stopped the invention of locomotive steam-engines in France, and the efforts of Cugnot.

Whilst the first machine of Cugnot was in course of construction, in 1769, a Swiss officer, named Planta, presented to the Duke de Choiseul a similar project; but perceiving that Cugnot's machine was preferable to his own, he did not proceed any further with it.

Fig. 7, Plate VIII., is a longitudinal section of Cugnot's engine, and fig. 8, is a transverse section thereof.

The machine is composed of two parts; the front one (in place of the horse) being supported by a single driving-wheel M; and these two parts are united by a moveable pin E, and a toothed sector S, fixed on the framing L, of the front part. The hind part T, is merely a carriage on two wheels R, intended to convey the load, and furnished in front with a seat B, for the conductor. The fore part carries the copper boiler C (having a furnace inside, provided with two small chimneys), the two single-acting brass steam cylinders A, (communicating with the boiler by the pipe O,) and the machinery for communicating the motion of the pistons to the driving-wheel M.

When one of the pistons P, descends, the piston-rod D, draws with it the crank F, the catch of which causes the driving-wheel to make a quarter of a revolution, by means of the ratchet-wheel G, fixed on the axle of the driving-wheel; at the same time, the chain H, fixed to the crank on the same side, descends also, and moves

the lever I, the opposite end of which is raised, and restores the second piston to its original position at the top of the cylinder, by the interposition of a second chain and crank. The piston-rod of the descending piston, by means of a catch Y, causes the levers Q,' to turn round, moving the levers Z, at the same time; and the chain fixed to them turns the four-way cock W, and opens the second cylinder to the steam, and the first cylinder to the atmosphere. The second piston then descends in its turn, causing the driving-wheel to make another quarter revolution, and restores the first piston to its original position; and thus the process is repeated.

In order to admit of changing the direction of the motion, and make the vehicle run backwards, the catch of the crank F, was arranged in such a manner that it could at pleasure be made to act either above or below. To obtain a backward motion, it was merely necessary to make it act on the upper side (changing the position of the spring which pressed upon it); then, when the piston drove it down, it slipped over the ratchet-wheel, and, on the other hand, the catch on the opposite side was raised by the lever, and turned the wheel a quarter revolution in the direction contrary to the original motion.

The conductor could further turn the carriage at an angle of from 15° to 20°, by means of a set of cog-wheels N, the last of which worked on the toothed sector S, and the first of which was turned by a spindle, furnished at the top with a double handle in front of the seat B.

It will no doubt be in the recollection of most of the members, that the earliest recorded date of any other locomotive was that of Murdock, in 1784, being 15 years later than Cugnot's engine.

Various persons have suggested the moving vehicles by steam, but none it appears so early as Cugnot, who actually ran an engine on land. Papin, certainly, in his work published at Capel, in 1699, suggested the use of ratchets, to convert the motion of a piston into a circular motion; but it does not appear that he had any idea of a locomotive.

After the date of Cugnot's engine, there are several persons whose names should be mentioned as having suggested the use of steam for locomotion, viz., Watt, in 1784; Oliver Evans, in 1786; Professor Robinson, in 1795; and lastly, Trevithick and Vivian, in 1804, who not only ran a locomotive steam-engine, but laid down rails for it to run on, at Merthyr Tydvil, in South Wales.

The following paper, by Mr. ALEXANDER ALLAN, of Crewe, was then read:—

Description of an oil axle-box for engines and tenders.

An axle-box for the driving-wheels of passenger engines is shewn in longitudinal section at fig. 9, Plate VIII., and in trans-

verse section at fig. 10. A, is the axle-box, of cast-iron, with two wrought-iron pieces cast in the sides of it. B, is the axle-step, which is carried 1 inch below the centre, to assist the sides in resisting the horizontal thrust; and the inside edge W, is also carried lower than the outside of the sponge-box, which carries the oil over the joint of the axle-step and sponge-box joint. S, is the sponge-box; in which are placed one or two pieces of sponge, a little thicker than the distance from the axle to the bottom of the sponge-box. The axle is 6½ inches in diameter, and is supplied with oil by a covered syphon-box on the top of a straight tube P, about 3 feet long, placed directly over the axle at X; which tube enters 1½ inch into the axle-box, and allows the engine to rise or fall 1½ inch: the delivery of oil on the proper place is therefore certain. I, I, are two pins, ½ inch round iron, to support the sponge-box. E, is the connection with the spring; F, is the pin which connects E, with the sides of the axle-box; and T, are pieces of wrought-iron, cast in the axle-boxes, having the lower ends drilled for the pin F.

Axle-boxes for the leading and trailing wheels of passenger engines, and also of tenders, similar to those experimented on, are shewn at figs. 11 and 12. A, is a cast-iron axle-box, with strong covered top to support the weight; under which top there is a cored-out hollow space, open at one end; and into this hollow the brass oil-cup C, is fitted. B, is the axle-step, 1 inch thick, with 3 snugs, to resist the lateral strain, and with two countersunk oil holes. C, is the oil-cup, with two tubes forming syphons, and a handle H, for lifting it out to trim &c.; and S, is the sponge-box, into which a narrow slip of sponge is placed, to catch the surplus oil as it leaves the axle-bearing.

In accordance with the request at the last meeting of the Institution, the following experiments have been made on the consumption of oil in the axle-boxes of tenders alone, fitted with oil receivers and sponges for collecting the oil, as described above. These experiments lasted seven days.

	s.	*d.*	
6·08 quarts of oil used, at 9d. per quart	4	6¾	
Four sponges at ½d. each	0	2	
For running 6000 miles	4	8¾	or ¾d. per day.

This result was obtained by running 1972 miles, with three tenders, and reduced to 6000 miles as a mean of comparison with the axle-box described at the last meeting. The same system has been in operation on the Northern Division of the London and North Western Railway for the last ten or twelve years.

Mr. Allan stated, in reply to Mr. Lea, that the four bearings of the tender alone were tried. He had checked the experiment by trying it with other men, and found very little variation in the consumption: they had never exceeded one penny per day.

Mr. Lea said he should be glad to try a corresponding experiment with the new lubricating composition that he had mentioned at the last meeting of the Institution, which was quite applicable to that kind of axle-box, and he considered would effect a considerable further economy. He proposed to try the journals on the opposite sides of the tender or carriage, with the two different lubricating materials at the same time, so as to ensure equality of load and mileage under all circumstances.

Mr. Fothergill observed that the diameter and width also of the journals was of much importance in the lubrication; in small machinery, in particular, the size of journals made a great difference.

LIST OF GRANTS OF PROVISIONAL PROTECTION UNDER THE NEW LAW.

Cases in which a full Specification has been deposited.

389. Valentine Cocker, of Salford, and Reuben Herbert, of Manchester, for certain improvements in and applicable to looms for weaving,—being a communication.—February 15.
429. Nathan Dutton, of Liverpool, for improvements in the manufacture and application of dowels and machinery connected therewith; parts of which machinery are applicable to other purposes.—February 18.
577. John Hall and John Crofts, both of Birmingham, for an improvement or improvements in revolving or repeating firearms.—March 7.
593. James Hogg, jun., of Nicolson-street, Edinburgh, for certain improvements in machinery or apparatus for cutting paper and other substances.—March 9.
650. John Vanden Hielakker, of Brussels, for an improved excentric engine, applicable to the purposes of general navigation.—March 16.

Cases in which a Provisional Specification has been deposited.

106. Hippolyte Charles Vion, of Paris, for certain improvements in apparatus for refrigerating.—[*Dated January 15th.*]
228. Thomas Hood Wilson, of Twickenham, for an invention for securing carriage gates, doors, shutters, and sash casements.—[*Dated January 29th.*]
243. David Stevens Brown, of Alexandrian Lodge, Old Kent-road, for certain improvements in barometers; part of which invention is applicable to the registry of other fluctuations than those of barometers.—[*Dated January 31st.*]
248. Richard Palmer, of Bideford, for an invention which may be used for cutting turnips, mangold wurtzel, carrots, and other

roots, or for bruising them only, or reducing them to a pulp, and for mixing them with meal as may be required; and also for grinding or crushing apples for cider.—[*Dated Jan.* 31*st.*]

292. John Heckethorn, of Marquis Villas, Canonbury, for an improved coloring matter for coating or covering the exterior or interior of buildings; some of the ingredients of which such coloring matter is composed being capable of conversion into size, paste, and ground-color, for priming or giving the first coat or covering to work intended to be colored with oil paint.—[*Dated February 3rd.*]

353. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in instruments or apparatus for facilitating the examination of various internal parts of the human frame,—being a communication.—[*Dated Feb.* 10*th.*]

362. Robert Roger, of Stockton-on-Tees, for improvements in obtaining motive power.—[*Dated February* 10*th.*]

364. Robert Thomas, of Manchester, for improvements in machinery or apparatus applicable to planing, slotting, shaping, grooving, or other similar purposes.

365. Sir James Murray, of Dublin, for improvements in deodorizing cod liver oil, in rendering it more agreeable and easier to use, either by itself or mixed, and so as to be capable of being administered in larger quantities and with greater success.

366. Antoine Sanguinède, of Paris, for an improved clasp or buckle.

367. William Choppin, of the City of London, for improvements in locks.

368. Robert Davis Rea, of St. George's-road, Southwark, for improvements in bits.

The above bear date February 11*th.*

369. Thomas Robert Mellish, of Sloane-street, for improvements in the construction and mode of closing scent and other bottles.

370. John Fordham Stanford, of Arundel-street, for an improvement in the method of draining dwelling-houses and other buildings, and open and enclosed spaces in cities and towns where sewers and drains are now or may be hereafter constructed.

371. George Winiwarter, of Red Lion-square, for improvements in fire-arms.

372. Thomas James Perry, of the Lozells, Birmingham, for a new or improved method of constructing cornice-poles, and picture and curtain-rods, and other rods from which articles are suspended.

373. George Parry, of the Ebbw Vale Iron Works, Monmouth, for improvements in blast furnaces.

374. George Henry Bursill, of Offord-road, Barnsbury-park, for improvements in operating upon auriferous quartz, clays, and other minerals, preparatory to and in order to accomplish the

separation of the gold and other metals; also in machinery or apparatus for effecting such improvements.

375. George Lee Lysnar, of Park-street, Grosvenor-square, for improvements in swivel hooks and such like fasteners.

376. William Pidding, of the Strand, for improvements in crushing, drilling, or otherwise treating ores, stone, quartz, or other substances in mining operations, and in the machinery or apparatus connected therewith.

377. William Pidding, of the Strand, for improvements in the treatment of oleaginous, fatty, or gelatinous substances, for purifying, decolorizing, compounding, or clarifying the same.

378. Charles Hadley, of Birmingham, for improvements in the means of communication between the passengers, guard, and driver of a railway train; parts of which improvements are applicable to communicating on vessels.

The above bear date February 12*th.*

379. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in apparatus to be employed for veneering surfaces,—being a communication.

380. Charles John Burnett, of Edinburgh, for certain improvements in apparatus or mechanism for driving machinery through the agency of water.

381. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for certain improvements in treating fibrous substances,—being a communication.

382. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for improvements in the mode of giving flexibility to beds, sofas, seats, and other similar articles,—being a communication.

383. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for certain improvements in the manufacture of tiles for roofing,—being a communication.

384. Jean Antoine Gervais, of South-street, Finsbury, for certain improvements in treating fermentable liquids, and in the machinery or apparatus employed therein.

385. Francis Clarke Mouatis, of South-street, Finsbury, for an improved mode of raising water.

386. Claude Joseph Lambert, of South-street, Finsbury, for certain improvements in the preparation of bread and biscuits.

The above bear date February 14*th.*

387. William Clark, of Chancery-lane, for improvements in the manufacture of colors and paints,—being a communication.

388. John Bethell, of Parliament-street, for improvements in obtaining copper and zinc from their ores,—a communication.

390. Benjamin Greening, of Manchester, for improvements in machinery for making fences and other similar articles of wire.

391. Thomas William Kennard, of Duke-street, Adelphi, for improvements in apparatus for improving the draught of chimneys.

392. Frederick Chinnock, of Regent-street, for improved means of securing axles in their boxes,—being a communication.
393. George Stiff, of Brixton-hill, for certain improvements in manufacturing paper.
394. Adolphe Nicole, of Dean-street, for improvements in rotary engines.
395. Alphonse Rene le Mire de Normandy, of Judd-street, for improvements in the manufacture of articles made of gutta-percha,—being partly a communication.
396. William Blissett Whitton, and George Samuel Whitton, of Princes-street, Lambeth, for improvements in the manufacture of sewer and other pipes.
397. Joseph and Alfred Ridsdale, of the Minories, for improvements in ships' side-lights, scuttles, or ports.
398. Henry Dircks, of Moorgate-street, for an improved sewing-machine,—being a communication.
399. Henry Francis, of West Strand, for improvements in instruments for cutting wool, hair, and vegetable matters.

The above bear date February 15*th.*

400. Henry Stephen Ludlow, of Bristol, for an improved process for simultaneously removing dust, stones, or other foreign matter, and for separating the superior and inferior grains in wheat, barley, and malt.
401. Job Cutler, of Birmingham, for improvements in the manufacture of spoons and forks, and other similar articles for domestic use.
402. Benjamin Cook, of Birmingham, for improvements in apparatus for lighting fires.
403. George Gray Mackay, of Grangemouth, near Falkirk, for improvements in the construction of drain-pipes.
404. Joseph Skertchly, of Kingsland, for improvements in copying presses.
405. John Day, of Islington, for improvements in apparatus for holding and protecting insulated telegraphic wires.
406. Edouard Sy, of Clifford-street, for improvements in bookbinding.
407. John George Perry, of Westbourne-street, for improvements in bookbinding, to facilitate the finding of places in books.
408. Charles Sheppard, of Maesteg Iron Works, near Bridgend, for an improved stove and apparatus for heating air for blast purposes.
409. Wright Jones, of Pendleton, for improvements in machinery or apparatus for stretching woven fabrics.
410. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improvements in the manufacture of printing surfaces,—being a communication.

The above bear date February 16*th.*

411. John Collis Browne, of Dover Castle, for improvements in the propelling of vessels.
412. William Bridges Adams, of Adam-street, Adelphi, for improvements in railways.
413. James Murphy, of Newport, for improvements in the permanent way of railways.
414. William Pidding, of the Strand, for improvements in the treatment and preparation of saccharine substances, and in the machinery or apparatus connected therewith.
415. Matthias Walker, of Horsham, for improvements in vessels or apparatus for containing and preserving ale, beer, and other liquors.
416. Charles Gordon, of Washington, D.C. America, for an improved goniometric protractor, or instrument for setting out and measuring angles and other geometric figures.
417. David Cochrane, of Manchester, for certain improvements applicable to closing doors.
418. Thomas Clarke Ogden, of Manchester, and William Gibson, of the same place, for certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.
419. George Leopold Ludwig Kufahl, of Weymouth-terrace, City-road, for improvements in the application of atmospheric currents to the obtainment of motive power.
420. William Hawes, of Montague-place, Russell-square, for improvements in the manufacture and refining of sugar.
421. Charles Watt, of Selwood-place, Brompton, and Hugh Burgess, of Grove-terrace, Kentish-town, for improvements in coating iron with copper and brass.
422. Isaac Frost, of Tavistock-terrace, Upper Holloway, for improvements in reaping or cutting crops.

The above bear date February 17th.

423. James Horsfall, of Birmingham, for an improvement or improvements in the manufacture of piano-forte wire; applicable also to articles of iron and steel generally.
424. Peter Madden, of Kingstown, for improvements in propelling, steering, and regulating vessels.
425. Charles Butler Clough, of Tyddyn Mold, for certain improved apparatus for detaching boats or other floating vessels from their moorings or fastenings.
426. William Darling, of Glasgow, for improvements in the manufacture of malleable iron and other metals.
427. Charles Kinder, of Chesterfield, for improvements in mantel or chimney-pieces.
428. Henry Noad, of Stratford, for improvements in treating corn or grain, and obtaining products therefrom.

The above bear date February 18th.

430. James Chadnor White, of Liverpool-street, for improvements in fastenings for harness; and which are also applicable to other like purposes,

431. Frank Clarke Hills, of Deptford, and George Hills, of Lee, for certain improvements in refining sugar, and in preparing materials applicable to that purpose.

432. William Rawbonn Dell, of Warrington, for improvements in the manufacture of cylinders coated with fine wire webbing, for dressing fine flour by the process of gravitation or sifting, without the aid of any internal brushes or fans.

433. Charles Cowper, of Southampton-buildings, for improvements in the manufacture of oxide of zinc or zinc-white, and in apparatus for that purpose,—being a communication.

434. Charles Nightingale, of Wardour-street, for certain improvements in drying and heating certain substances or articles.

435. James Anderson, of Auchnagie, for improvements in obtaining motive power.

436. Pierre Auguste Tourniere, of Kennington-terrace, for improvements in propelling.

The above bear date February 19*th.*

437. Wright Jones, of Pendleton, for improvements applicable to steam-pipes used for warming, drying, or ventilating.

438. Samuel Rodgers Samuels and Robert Sands, both of Nottingham, for improvements in looms for weaving.

439. John O'Leary, of Liverpool, for certain improved apparatus for indicating the number of passengers entering in or upon omnibuses, and also their exit therefrom.

440. Joseph Ramage, of Manchester, and Thomas Coffey, of the same place, for certain improvements in the manufacture of chandeliers, gas-brackets, and lamp-frames.

441. James Mash, of Highfield-terrace, Kentish-town, and Joseph Sharp Bailey, of Keighley, for improvements in weaving machinery employed in the manufacture of textile fabrics, and in the manufacture of such fabrics.

442. William Pidding, of the Strand, for improvements in coverings for the feet of bipeds or quadrupeds.

443. Richard Farrant, of Pimlico, for an improved chimney-pot.

444. Ezra Miles, of Soulbury, for improvements in railway brakes.

445. Thomas Bell, of Bristol, and Richard Chrimes, of Rotherham, for certain improvements in valves, applicable to the receiving and discharging of water or other fluids.

446. Benjamin Barton, of Old Kent-road, for an improved bath; which can also be used as a life-boat.

447. John Charles Pearce, of the Bowling Iron Works, near Bradford, for improvements in steam-boilers.

448. John Davie Morries Stirling, of the Larches, near Birmingham, for improvements in the manufacture of wire.

449. William Wilkinson, of Nottingham, for improvements in the manufacture of ropes, bands, straps, and cords.

The above bear date February 21st.

450. James Hudson, of Halifax, and Thomas Bamford Hudson, of Malton, for improvements in the manufacture of bricks, tiles, and drain-pipes or tubes.
451. Pierre Frederick Gougy, of Castle-street, and David Combe, of King-street, for improvements in apparatus for skidding or stopping wheels of carriages and other vehicles.
452. George Winiwarter, of Red Lion-square, for improvements in the manufacture of fire-arms.
453. John Richard Cochrane, of Glasgow, for improvements in the mauufacture or production of ornamental or figured fabrics.

The above bear date February 22nd.

454. Samuel Beckett, of Manchester, for an improvement or improvements in mule spindles, and spindles of a similar description, for spinning or twisting various fibrous substances, and in the mode of manufacturing and producing the same.
455. John Smith, of Uxbridge, for improvements in machinery for raising and forcing water and other fluids.
456. Edwin Stanley Brookes, Joseph Black, George Stevenson, and William Jones, all of Loughborough, for improvements in machinery for the manufacture of looped fabrics.
457. Edouard Albrecht, of Upper Fountain-place, City-road, for improvements in apparatus for transmitting and reflecting light.
458. Reuben Plant, of Brierley-hill, for improvements in safety-lamps.
459. Robert Milligan, of Harden Mills, Bingley, for improvements in apparatus for washing slivers of wool.
460. Samuel Cunliffe Lister, of Bradford, for improvements in treating soap-suds.
461. Asa Willard, of Saint John, New Brunswick, America, for improvements in machines for manufacturing butter, to be called "A. Willard's butter-machine."
462. Adam Cyrus Engert, of Mora-place, City-road, for improvements in joints for the sticks of parasols and other like purposes,—being a communication.

The above bear date February 23rd.

463. John Green, of York-buildings, New-road, for the more economic, speedy, convenient, and, in every respect, superior system of cooking to any now in use, and which he designates "Green's economical self-basting cooking apparatus."
464. William Spence, of Chancery-lane, for certain improvements in machines for thrashing and winnowing corn and other agricultural produce,—being a communication.
465. Henry Walmsley, of Failsworth, near Manchester, and Thomas Critchley, of the same place, for improvements in

machinery or apparatus for retarding or stopping railway trains; which machinery or apparatus is also applicable as a signal or communication from one part of a train to the other.

466. Peter McLellan, of Bridge of Earn, Perthshire, for improvements in thrashing machinery.

467. William Johnson, of Lincoln's-inn-Fields, for improvements in the treatment or manufacture of caoutchouc,—being a communication.

469. Thomas De la Rue, of Bunhill-row, for improvements in producing ornamental surfaces to paper and other substances.

470. Emile Adolphe Herrmann, of New Broad-street, London, for certain improvements in machinery for manufacturing woollen cloth,—being a communication.

471. James Lawrence, of Colnbrook, for improvements in the drying or preparation of malt, meal, seeds, corn, and other grain.

472. Thomas Browne Jordan, of New Cross, for improvements in machinery for planing slate.

The above bear date February 24th.

473. Francis Preston, of Manchester, for improvements in the manufacture of certain parts of machinery to be used in preparing and spinning cotton or other fibrous materials.

474. John Hynam, of Wilson-street, Finsbury, for improvements in the mode of manufacturing wax or composition tapers, and in the machinery or apparatus for that purpose.

475. Benjamin Price, of Whitechapel, for certain improvements in the construction of furnaces or flues of steam-boilers, coppers, and other like vessels for heating or evaporating liquids.

476. John Grist, of Hoxton, for improvements in machinery for the manufacture of casks, barrels, and other similar vessels.

477. William Symington, of Gracechurch-street, for improvements in preserving milk and other fluids.

478. John Palmer De la Fons, of Carlton-hill, St. John's-wood, for improvements in applying skids or drags to omnibuses.

479. Thomas Richardson, of Newcastle-upon-Tyne, for improvements in the manufacture of certain compounds of phosphoric acid.

480. Henry Martyn Nicholls, of Gower-place, for improvements in emission or reaction engines.

481. Antonio Fedele Cossus, of University-street, for improvements in filters.

482. John George Taylor, of King-street, Cheapside, for improvements in ornamental fastenings for dress.

483. Frederick Goodell, of Half Moon-street, for an improved apparatus for the distillation of rosin oil, and for an improved method of bleaching and deodorizing the same during the process of manufacture,—being partly a communication.

The above bear date February 25th.

484. Charles Napoleon Wilcox, of Islington, for improvements in the manufacture and application of certain extracts obtained from the elder tree.

485. Jean Joseph Fréchin, of Bordeaux, for improvements in the construction of locomotive engines.

486. William Mackenzie Shaw, of Brighton, for an improvement in the construction of locomotive boilers.

487. Joseph Brandeis, of Great Tower-street, for improvements in the manufacture and refining of sugar.

488. Mark Henry Blanchard, of Blackfriars-road, for improvements in the manufacture of pipes of earthenware, clay, or other similar materials.

489. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in machinery or apparatus applicable to wheels or axles for counting and indicating the number of rotations made thereby,—being a communication.

490. Ebenezer Thornton, of Huddersfield, for certain improvements in the construction and arrangements of kitchen boilers and flues for ranges.

491. The Honourable James Sinclair, commonly called Lord Berriedale, of Hill-street, for improvements in weaving.

492. Robert Griffiths, of Great Ormond-street, for improvements in propelling vessels.

493. Charles Tetley, of Bradford, for improvements in obtaining power by steam and air.

494. Charles Tetley, of Bradford, for improvements in the manufacture of bobbins.

495. Samuel Varley, of Wainfleet, Lincolnshire, for improvements in making communications between the guards and engine-drivers on railway carriages.

496. Admiral the Earl of Dundonald, of Belgrave-road, for improvements in producing compositions or combinations of bituminous, resinous, and gummy matters, and thereby obtaining products useful in the arts and manufactures.

497. Theodore Baron Von Gilgenheimb, of Weidenau, Silesia, for a new machine, with its adjuncts or other apparatus, to be used for agricultural purposes.

The above bear date February 26th.

498. James Murphy, of Newport, for improvements in trucks, waggons, or vehicles for railway purposes.

499. Thomas Edward Merritt, of Maidstone, for improvements in railway carriages, and in connecting and disconnecting them.

500. Martyn John Roberts, of Woodbank, Gerards Cross, for improvements in the manufacture of mordants or dyeing materials, which are in part applicable to the manufacture of a polishing powder.

501. Edward Hammond Bentall, of Heybridge, Essex, for improvements in harrows.

502. George Duncan, of Chelsea, for improvements in steam boilers.
503. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for improvements in drying cigars,—being a communication.
504. Joseph Major, of Little Stanhope-street, for improvements in preparing lotions, which he intends to call the "Synovitic lotions."
505. Samuel Cunliffe Lister, of Manningham, Yorkshire, for heating and making cards.

The above bear date February 28th.

506. Robert Stephenson, jun., of Newcastle-upon-Tyne, for improvements in locomotive engines.
507. Thornton Littlewood and Charles Littlewood, of Rochdale, for improvements in machinery or apparatus used in the preparation of wool, silk, flax, and mohair, to be spun.
508. John Bethell, of Parliament-street, for improvements in preserving wood from decay.
509. Joseph Clisild Daniell, of Limpley Stoke, for propelling vessels of all descriptions that float on water that are capable of carrying steam or any other engines used for the purpose of giving power to propel vessels,—also for propelling carriages on roads to which engines, for the purpose of giving power to work them, can be applied.
510. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in capstans,—being a communication.
511. Edward Charlesworth, of York, for improvements in bill or letter holders.
512. William Rowett, of Liverpool, for improvements in making paddle-wheels for vessels propelled by motive power, which is called "the cylinder paddle-wheel."
513. Charles Flude, of the Canal Bank Distillery, Old Kent-road, and James Waterman, of Park-street, Southwark, for improvements in the application of heat for producing evaporation, generating steam, and for general heating purposes; and also in the economical production of combustible gases for the purpose of illumination.
514. John McAdams, of Massachusetts, America, for improvements in machinery or apparatus for printing on leaves of books their designations, numbers, or devices, or those of their pages; which machinery or apparatus may also be used to advantage for printing designating numbers or devices on various other articles.
515. Robert Lewin Bolton, of Liverpool, for a new mode of obtaining and using power by explosion of gases.

The above bear date March 1st.

516. Laurence Hill, jun., of Port Glasgow, for improvements in the production of motive power,—being a communication.

517. Charles Henry Hall, of Liverpool, for an improved apparatus for cooking by gas or vapour.
518. Howard Ashton Holden, Alfred Knight, Edward Bull, and John Banfield, all of Birmingham, for certain improvements in communicating and giving signals between the engine drivers and guards on railway trains,—being in connection with a mode already patented for effecting the same object.
519. James Abbott, of Accrington, for certain improvements in and applicable to machines for winding yarn or thread, called winding machines, used in the manufacture of cotton and other fibrous substances.
520. Alexis Soyer, of Fenchurch-street, London, for improvements in preparing and preserving soups, which he denominates "Soyer's osmazome food."
521. John Smith, of Upper Fountain-place, City-road, William Henry Smith, of the same place, and Alexander Williams, of Seething-lane, for certain improvements in metallic plates, and in producing devices or ornamental patterns thereon, and in the apparatus and machinery to be used for such purposes.
522. Edward Duke Moore, of Ranton Abbey, Staffordshire, for an improved mode of treating the extract of malt and hops.
523. Lewis Jennings, of Fludyer-street, for an improved apparatus for regulating the speed of machinery.
524. Alfred Augustus de Reginald Hely, of Cannon-row, Westminster, for an improved door or finger-plate.
525. Robert Waddell, of Liverpool, for improvements in steam-engines.
526. Marcel Vetillart, of Le Mans, France, for improvements in drying yarns.
527. Willoughby Theobald Monzani, of High-street, Camden-town, for improvements in reaping machinery.

The above bear date March 2nd.

528. William Clark, of High-street, Islington, for improvements in propelling and steering vessels, and in the apparatus used therein.
529. James Murdoch, of Staple-inn, for an improved process for the manufacture of iodine,—being a communication.
530. Simon O'Regan, of Belfast, for improvements in apparatus for consuming smoke.
531. Charles Humpage, of King's Norton, Worcester, for the application of certain materials to the manufacture of coffin furniture.
532. Robert Barclay, of Montrose, for improvements in rotatory engines for obtaining motive power, and for transmitting aeriform bodies and fluids.
533. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in locomotives; part of which improvements are applicable to other steam-engines,—a communication.

534. Martin Billing, of High Holborn, for certain improvements in metallic bedsteads.
535. Samuel Colt, of Spring-gardens, for improvements in rotating breech fire-arms,—partly a communication.
536. Samuel Colt, of Spring Gardens, for an improved construction of blower,—being a communication.
537. Samuel Colt, of Spring-gardens, for improved machinery for forging metals,—partly a communication.
538. Samuel Colt, of Spring Gardens, for improvements in rotating-breech fire-arms,—being partly a communication.
539. Bernard Chaussenot, the elder, of Paris, for improvements in apparatus for aerating liquids.
540. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in primers for fire-arms,—being a communication.
541. John Wright, of Camberwell, for improvements in machinery for manufacturing bags or envelopes of paper, calico, or textile fabrics.
542. Thomas Crick, of Leicester, for improvements in the manufacture of boots, shoes, clogs, and slippers.
543. James Waterman, of Park-street, Southwark, for improvements in treating brewery and distillery grains, for the production of food for cattle, and for extracting the bitter principle and other products from the refuse hops of breweries.

The above bear date March 3rd.

544. John Hinks and George Wells, both of Birmingham, for a new or improved metallic pen.
545. Robert Craib Ross, of Edinburgh, for an improved machine or instrument for cutting files and forging metal.
546. George Elliot, of St. Helen's, Lancashire, for certain improvements in manures.
547. Joseph Sparkes Hall, of Regent-street, for improvements in cutting out parts of boots and shoes.
548. William Sandilands, of Elm Tree Lodge, South Lambeth, for an improved hopper for a piano-forte.
549. Samuel Hazard Huntly, of Marylebone-lane, for improvements in controlling and regulating the flow or pressure of gas.
550. Henry McEvoy, of Birmingham, for improvements in covered buttons.
551. George William Bott, of Manchester, for an improvement in apparatus called "pressers," employed in the preparation of cotton and other fibrous materials for spinning.
552. James Boydell, of Smethwick, for improvements in the construction of bedsteads.
553. John Davie Morries Stirling, of the Larches, near Birmingham, for improvements in manufacturing coated metal.

The above bear date March 4th.

554. Mary Ann Smith, of Wimpole-street, for improvements in the manufacture of toys, models, and other like articles of ornament or utility.
555. John Gedge, of Wellington-street, Strand, for improvements in the construction of fire-arms, and in the means of loading the same,—being a communication.
556. Baldwin Fulford Weatherdon, of Chancery-lane, and Charles Dealtry, of Guernsey, for improvements in the construction of certain floating vessels, and in the mode of propelling them.
557. Thomas Wells Cross, of Hunslet, for a portable fire-engine.
558. William Todd, of Rochdale, for improvements in steam-engines.
559. Joseph Maudslay, of Lambeth, for improvements in screw propellers for ships and other vessels.
560. Richard Archibald Brooman, of Fleet-street, for improvements in machinery for making pipes and tubes,—being a communication.
561. John Hirst, junior, of Dobcross, Yorkshire, and William Mitchell, of Crosland Moor, near Huddersfield, for improvements in stretching fabrics.

The above bear date March 5th.

562. Richard Barter, of St. Ann's Hill, Blarney, for improvements in cutting roots and other vegetable substances.
563. William Barrington, of Mallow, for an improvement in life-boats.
564. James Gascoigne Lynde, jun., of Great George-street, Westminster, for a pressure governor, or self-acting apparatus for regulating the flow of water.
565. Henry Mapple, of Child's Hill, Hendon, for certain improvements in electric telegraphs and apparatus connected therewith.
566. André Calles, of South-street, Finsbury, for certain improvements in manufacturing typographic characters.
567. Jacques François Dupont de Bussac, of King's-road, Chelsea, for certain improvements in paving and covering places,—being a communication.
568. Godfrey Simon and Thomas Humphreys, of Pennsylvania, America, for improvements in carriages.
569. William Matthews, of Nottingham, for improvements in piano-fortes.
570. Joseph John William Watson, of Old Kent-road, for improvements in illuminating apparatus, and in the production of light.
571. Thomas Weatherburn Dodds, of Rotherham, for improvements in the treatment and manufacture of iron and steel.
572. Charles Parker, of Dundee, for improvements in weaving.
573. John Little, of Glasgow, for improvements in cooking apparatus.

574. Thomas Weatherburn Dodds, of Rotherham, for improvements in the manufacture of wheels and axles.

576. Thomas Turner Chatwin, and Robert Mc Leish, both of Birmingham, for improvements in rollers, rods, or poles, for window blinds, curtains, maps, and such like purposes.

The above bear date March 7th.

578. Charles Finlayson, of Manchester, for improvements in apparatus for converting reciprocating into rotatory motion for steam-engines, and for other purposes.

579. Thomas James Perry, of the Lozells, Birmingham, for a new or improved method of constructing cornice poles, and picture and curtain rods, and other rods from which articles are suspended.

580. Thomas Dryland, of Bishopsgate-street Within, for an improved portable iron stove.

581. Jacques Francisque Pinel, of Pall Mall, for improvements in deodorizing sewage water and cesspools, and in manufacturing manures.

582. Nicolas Schmitt, of Goffontaine, Prussia, for improvements in cleansing and separating ores and coal.

583. Charles Baker, of Southampton, for improvements in moulds for the manufacture of bricks.

585. John Wright, of Camberwell, for improvements in the construction of bedsteads and other frames.

586. Alexander Samuelson, of Hull, for improvements in the manufacture of bricks and tiles.

587. Frederick William Emerson, of Penzance, for improvements in obtaining tin from ores.

588. James Veevers, of Littleborough, and Henry Ashworth, of the same place, for certain improvements in machinery or apparatus to be employed in the preparing of cotton and other fibrous materials for spinning.

589. Thomas Glover, of Woodstock, for a certain improvement in the construction of buttons, and in the mode of applying the same to gloves and other articles of dress.

590. John Colquhoun, of Paisley, for improvements in bleaching or sulphuring silk, woollen, cotton, and other woven fabrics and yarns.

591. John James Alexander Maccarthy, of Howland-street, for improvements in gunnery and projectiles, with pouch for the latter, which are adapted for muskets, rifles, pistols, and heavy cannon for field-pieces or forts, batteries, ships of war, and other vessels.

The above bear date March 8th.

592. James Kimberley, of Birmingham, for a new or improved gas stove.

594. Samuel Blackwell, of Oxford-street, for an improved strap or band for connecting together certain parts of harness and saddlery, applicable also to other purposes where straps or bands are used.
595. Samuel Blackwell, of Oxford-street, for improvements in saddlery and harness.
596. François Valtat and François Marie Rouillé, of Rue Rambuteau, Paris, for improvements in the construction of the combs of looms for weaving.
597. Joseph Shuttleworth, of Lincoln, for improvements in appendages to portable machines for thrashing, shaking, and winnowing corn.
598. William Pidding, of the Strand, for improvements in the treatment or manufacture of caoutchouc or gutta-percha, in fabrics obtainable therefrom, and in the machinery or apparatus employed therein.
599. George Chambers, of Russia-row, Cheapside, for improved means of gathering cinders and depositing ashes under fire-grates, securing economy in fuel and cleanliness of appearance.
600. Theophilus John Nash, of High Holborn, for improvements in churns.
601. George Collier, of Halifax, for improvements in the manufacture of carpets and other fabrics.
602. Edward Maitland Stapley, of Lawrence-lane, for improvements in machinery for breaking and dressing flax and other fibrous materials,—being a communication.
603. Henry Ransford, of Chelsea, for improvements in the manufacture of starch.
604. William August Holskamp, of Ossulston-street, Somers-town, for an improved castor for legs of furniture, and other purposes.
605. George Collier and Samuel Thornton, of Halifax, for improvements in spinning, roving, doubling, and twisting cotton, worsted, flax, and other fibrous materials.
606. Frederick William Campin, of the Strand, for an instrument for measuring the steerage-way of vessels, and the rapidity of currents of water and air, applicable to ventilating ships and railway carriages,—being a communication.

The above bear date March 9th.

607. James Walmsley, of Scout Newchurch, near Manchester, for improved machinery and arrangements for block printing.
608. John Powis and Jabus Stanley James, both of Watling-street, for improvements in machinery for slotting, tenoning, morticing, grooving, drilling, boring, and vertical planing.
609. Edward Taylor Bellhouse, of Manchester, for improvements in iron structures.
610. Thomas Butler Dodgson, of Upper Clapton, for improvements in roads or ways, pavements, and footpaths generally.

611. George Collier, of Halifax, for improvements in machinery or apparatus used in weaving.
612. The Honorable William Erskine Cochrane, of Albany-street, and William Marshall Cochrane, of Kingston, for improvements in girths or pads for retaining saddles in their places.
613. François Frederick Dumarchey, of Paris, for certain improvements in making roads and ways.
614. James Stevens, of Southwark Bridge-road, for improvements in apparatus for facilitating communications between the guard and engine-man of railway trains.
615. Emanuel Myers, of Ramsgate, for improvements in preventing railway engines and carriages running off the rails.

The above bear date March 10th.

616. Francis Preston, of Manchester, for improvements in the manufacture of bobbins and spools.
617. James Summers, of West Cowes, for improvements in certain kinds of sails.
619. Moses Poole, of Avenue-road, Regent's-park, for improvements in apparatus for serving oysters and other shell-fish,—being a communication.

The above bear date March 11th.

620. John Gilby, of Beverley, for improvements in fire-arms.
621. William Muir, of Manchester, for improvements in machinery or apparatus for grinding edge-tools and other articles.
622. Peter Armand Le Comte de Fontainemoreau, of South-street, for a new or improved apparatus for filtering liquids,—being a communication.
623. John Fry Heather, of the Royal Military Academy, Woolwich, for an equitable gas-weighing meter.
624. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in machinery for cutting standing crops and gathering the same into sheaves or bundles,—being a communication.
626. Thomas Evans, the younger, of Tooley-street, for certain improvements in the construction of steam boilers.
627. George Michiels, of Holywell-street, for improvements in obtaining oxygen for manufacturing purposes.
628. Thomas Hunt, of Leman-street, for improvements in the construction of sights for fire-arms.
629. Thomas Rhodes, of Leeds, for improvements in the manufacture of manure.
630. Robert Christopher Witty, of Portland-place, Wandsworth-road, for improvements in the manufacture of gas.
631. James Murdoch, of Staple-inn, for an improved construction of portable voltaic batteries,—being a communication.

The above bear date March 12th.

List of Patents

Granted for SCOTLAND, from the 22nd February to the 22nd March, 1853.

To Moses Poole, of Serle-street, London, for improvements in the elastic ribs, sticks, and fillets, used in the manufacture of umbrellas, parasols, and various other articles, in substitution of whalebone and steel heretofore used.—Sealed 23rd February.

Pierre Henri Bareau, of Paris, for certain improvements in the manufacture of carpets, velvets, and other fabrics.—Sealed 1st March.

Antoine Maurice Tardy de Montravel, of Paris, for certain improvements in obtaining motive power, and the machinery employed therein.—Sealed 1st March.

Joseph Walker, of Dover, merchant, for improvements in treating cotton-seeds, in obtaining products therefrom, and in the processes and machinery employed therein; parts of which improvements are applicable to distillation.—Sealed 4th March.

Richard Archibald Brooman, of Fleet-street, London, for improvements in the manufacture of sugar, and in the machinery and apparatus employed therein,—being a communication.—Sealed 4th March.

Joseph Jepson Oddy Taylor, of No. 18, Bucklersbury, London, naval engineer, for improvements in ships' boats and vessels, and in certain articles of ships' furniture.—Sealed 7th March.

Thomas Main, of 13, Philadelphia-terrace, Westminster-road, London, for improvements in printing machinery.—Sealed 7th March.

New Patents.

Sealed under old Law.

Joseph Gibbs, of Devonshire-street, civil engineer, for improvements in the treatment of metals and metalliferous ores.—Sealed 21st March, 1853.

Patents sealed under Patent Law Amendment Act, 1852.

8. Richard Wright, of Greenwich, for improvements in constructing vessels.—October 1.
12. Thomas Wood Gray, of Warkworth-terrace, Commercial-road, for improvements in steam-engines.—October 1.
18. Thomas Dickason Rotch, of Furnival's Inn, for improvements in treating peat, and in manufacturing fuel and other products therefrom.—October 1.

23. Jean Baptiste Lavanchy, of Richmond-buildings, Soho, for improvements in wind musical instruments where metal tongues are employed.—October 1.
38. Hon. William Erskine Cochrane, of Albany-street, for improvements in unloading coals from ships or vessels.—October 1.
53. Thomas Browne Dalziel, of Glasgow, for improvements in the treatment or manufacture of textile fabrics or materials.—October 1.
56. John Finlay, of Glasgow, for improvements in grates and fire-places, or apparatus for the generation of heat.—October 1.
64. Henry Richardson Fanshawe, of Arthur-street, Old Kent-road, for certain improvements in shawls, scarfs, neckerchiefs, handkerchiefs, mantles, sails or sail-cloth, table-cloths, and table-covers, napkins, and umbrella and parasol tops and covers; and in an improved loom for weaving, applicable especially to the said improvements, in respect to some of the said articles. —October 1.
71. John Ambrose Coffey, of Providence-row, Finsbury, for improvements in apparatus for performing various chemical and pharmaceutical operations, hereby denominated "Coffey's improved patent Esculapian apparatus,"—parts whereof are applicable to steam-boilers, steam and liquid-gauges, stills, and syphons.—October 1.
76. Christopher James Schofield, of Cornbrook, Hulme, for improvements in machinery or apparatus for cutting the pile of fustians and other fabrics.—October 1.
90. John Aspinall, of King William-street, for improvements in evaporating cane-juice and other liquids, and in apparatus for that purpose.—October 1.
100. William Potts, of Birmingham, for improvements in sepulchral monuments.—October 1.
101. Thomas Allan, of Adam-street, for improvements in the application of carbonic acid gas to motive purposes.—October 1.
106. Thomas Allan, of Adam-street, for improvements in propelling.—October 1.
107. Henry Columbus Hurry, of Adam-street, Adelphi, for an improved construction of fountain-pen or reservoir pen-holder. —October 1.
135. Robert Griffiths, of Great Ormond-street, for improvements in apparatus for indicating the number of persons entering and the distance travelled in public or other conveyances and places, and for the prevention of fraud upon proprietors of public conveyances.—October 1.
140. Thomas Robson, of Woolwich-road, for improvements in apparatus for igniting signal and other lights.—October 1.
153. David Stephens Brown, of Old Kent-road, for an agricultural implement for tilling the soil.—October 2.
164. John Robert Johnson, of Hammersmith, for improvements in fixing coloring matter of madder in printing and dyeing.—October 2.

168. John Macintosh, of Berners-street, for improvements in compositions to be used as paints.—October 2.

175. Michael Cavanagh, of Notting-hill, for certain improvements in mortice-lock spindles.—October 2.

177. William Simpson, and John Shelton Isaac, both of Maidstone, for an improved composition, to be used principally as a substitute for wood or other materials, where strength and lightness are required, in the manufacture of various articles.—October 2.

178. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in stoppers for bottles and other similar vessels.—October 2.

181. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in governors or regulators for regulating the pressure of gas as it passes from the main or other pipes to the burners.—October 2.

182. Samuel George Archibald, of Pall-mall, for an improved mode of extracting or rendering animal fats and oils.—Oct. 2.

189. Alexander Willison, of the Manse of Dundonald, in the county of Ayr, for improvements in thrashing machinery.—October 2.

207. William Donald Napier, of George-street, Westminster, and William Lund, of Cornhill, for improvements in apparatus for steering vessels.—October 4.

210. Henry Webb, of Willenhall, and Joseph Froysell, of the same place, for improvements in fastening knobs to door and and other locks.—October 4.

216. Archibald Brown, of Glasgow, for improvements in the construction of sheaves for blocks.—October 4.

217. Michael Angelo Garvey, of Jeffrey's-terrace, Kentish-town, for more effectually dissipating the shock of collision in railway trains, reducing the surfaces exposed to atmospheric resistance, and diminishing oscillation by making portions of the whole of each carriage elastic in every direction, and increasing the power of the carriage to resist severe pressure by means of metallic tubes in its longitudinal angles.—October 5.

219. Arthur Richard Burr, of Halesowen, for certain improvements in making gun and pistol-barrels, applicable to the manufacture of other kinds of tubes.—October 5.

220. David Stephens Brown, of Old Kent-road, for an improved apparatus or instrument for evaporating or distilling liquids.—October 5.

226. Diego Jimenez, of Percy-street, for improvements in the manufacture of soap.—October 5.

228. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in machinery for boring or cutting rocks or other hard substances, for the purpose of tunnelling through mountains or making other excavations.—October 5.

229. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in the means of producing a vacuum for various purposes, such as condensing steam, pumping water, exhausting air, or other purposes where a vacuum is required.—October 5.

231. George Walker Nicholson, of Pendleton, for improvements in screw-bolts, nuts, and washers, and in the machinery or apparatus for making the same.—October 5.

234. John Balmforth, William Balmforth, and Thomas Balmforth, all of Clayton, for improvements in steam-boilers, and in fixing the same.—October 5.

235. Adam and John Booth, both of Manchester, for improvements in platting or braiding machines; which machines are applicable to manufacturing webs for making door and other mats.—October 5.

236. Robert Brown, of Salford, for an improved taking-up motion, applicable to looms and other similar purposes.—Oct. 5.

238. William Gilbert Elliott, of Blisworth, for improvements in the manufacture of bricks, pipes, tiles, and other articles capable of being moulded.—October 5.

251. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in sewing machines.—October 6.

252. Jacob Tilton Slade, of Pall Mall, for an improved mode of driving certain machines, and an improved driving-band or chain to be used therewith.—October 6.

256. John Cronin Jeffcott, of Anglesea-street, Cork, for an invention for producing heat for generating steam, and applicable to and for other purposes for which this invention has not been hitherto used, under the name and title of "a heat-producer and steam generator."—October 6.

257. Alexis Delemer, of Radcliffe, for improvements in machinery or apparatus for manufacturing piled fabrics.—October 6.

259. George Walker Nicholson, of Pendleton, for improvements in vices, and in the means or method used for fixing the same.—October 6.

260. William Coles Fuller, of Bucklersbury, and George Morris Knevitt, of New York, for certain improvements in applying India-rubber, or other similarly elastic substance, as springs for carriages.—October 6.

262. Robert Mortimer Glover, of Newcastle-on-Tyne, and John Cail, of the same place, for improvements in miners' or safety lamps.—October 6.

267. Thomas Barker Walker Gale and Jonathan Fensom, of Homerton, for improvements in the means of joining or coupling bands or straps.—October 6.

269. William Vaughan Morgan, of Jewin-crescent, for improvements in the preparation of oils for the purposes of illumination and lubricating machinery.—October 6.

280. William Bissell, of Wolverhampton, for an improved cramp, or improved cramps, for cramping floors, doors, and joiners' and ship work generally.—October 7.
286. Auguste Edouard Loradoux Bellford, of Castle-street, for an improvement in smoothing irons.—October 7.
287. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in steam-boilers.—October 7.
298. Edward Joseph Hughes, of Manchester, for an improved method of purifying and concentrating the coloring matter of madder, munjeet, and spent madder.—October 8.
301. Samuel Smith, of Swinton, near Manchester, for certain improvements in looms for weaving.—October 8.
305. John Talbot Tyler, of Mount-street, Grosvenor-square, for improvements in hats, and in the preparation of plush or other covering used in the manufacture of hats.—October 8.
310. William Edward Newton, of the Office for Patents, 66, Chancery-lane, for improvements in the construction of hydraulic rams.—October 8.
311. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in apparatus for manufacturing soda-water and other aerated liquids.—October 9.
321. Samuel Hardacre, of Manchester, for improvements in machinery or apparatus for blowing, scutching, opening, cleaning, and sorting cotton, wool, and other fibrous substances; parts of which improvements are applicable to other purposes.—October 9.
322. George Gent, of Northampton, and Samuel Smith, of the same place, for a fruit cleaning and dressing machine.—October 9.
341. Edward Simons, of Birmingham, for improvements in lamps.—October 12.
347. Auguste Edouard Loradoux, Bellford, of Castle-street, for improvements in sewing cloth and other materials.—October 12.
352. Thomas Dawson, of Milton-street, for improvements in the means of cutting pile or terry fabrics.—October 12.
353. Thomas Lacey, of Grafton-street, for improvements in apparatus for raising liquids, and in joints for uniting India-rubber and other like flexible tubing.—October 12.
354. Joseph Walker, of Dover, for improvements in machinery for crushing and bruising malt, grain, and seeds.—October 12.
356. Joseph Robinson, of Southampton, for improvements in ventilators.—October 12.
361. Joseph Pimlott Oates, of Lichfield, for an improved spring or improved springs for carriages.—October 13.
377. Martyn John Roberts, of Woodbank, Gerrard's-cross, for improvements in galvanic batteries, and in obtaining chemical products therefrom.—October 13.
388. Alsop Smith, of Westminster, for improvements in the manufacture of fire-wood.—October 14.

401. William Edward Newton, of the Office for Patents, 66, Chancery-lane, for improvements in washing and amalgamating gold and other metals.—October 15.

435. John Goodman, of Hazel-grove, Cheshire, for an improved fountain pen.—October 19.

442. William Newton, of the Office for Patents, 66, Chancery-lane, for an improved machine for separating ores, metals, and other heavy substances, from mud, sand, gravel, stones, and other impurities.—October 19.

447. George Gadd, of Fisher-gate, Nottingham, for improvements in apparatus for roasting coffee.—October 19.

455. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in cocks or taps.—October 20.

508. William White, of Cheapside, for an improved fabric, suitable for ventilating hat-bodies.—October 23.

515. Robert William Mitcheson, of Garford-street, for improvements in anchors.—October 25.

521. John Cass, of Blue Pits, near Rochdale, for improvements in steam-engines.—October 26.

529. Robert William Mitcheson, of Garford-street, for an improved safety-hook.—October 26.

538. Alfred Charles Hervier, of Paris, for an improvement in the application of centrifugal force to propelling on water.—October 27.

543. John Norton, of Cork, for improvements in blasting.—October 27.

553. Charles Frederick Bielefeld, of the Strand, for improvements in billiard and bagatelle tables.—October 28.

562. Arnold James Cooley, of Parliament-street, for improvements in treating woven and felted fabrics, to render the same repellant to water and damp.—October 29.

575. Pierre Bernardet de Lucenay, of Paris, for the production of photographic images by means of artificial light.—October 30.

584. George Thomas Selby, of Smethwick Tube Works, Birmingham, for improvements in steam-boilers.—October 30.

586. George Thomas Selby, of Smethwick Tube Works, Birmingham, for improvements in machinery for the manufacture of tubes and pipes.—October 30.

593. Edward Lawson, of Leeds, for certain improvements in machinery for preparing to be spun, hemp, flax, tow, wool, silk, cotton, and other fibrous materials.—November 1.

610. William Edward Newton, of the Office for Patents, 66, Chancery-lane, for improvements in the manufacture of capsules or covers for bottles and other hollow articles.—November 2.

612. James Dible, of Northam, for improvements in ventilating and heating ships; which improvements are also applicable to extinguishing fire on board ship.—November 2.

615. Charles Dickson Archibald, of Rusland Hall, Milnthorpe, for improvements in lighting and heating.—November 2.

633. John Macintosh, of Berners-street, for improvements in projectiles and cartridges.—November 3.
647. John Henderson Porter, of Birmingham, for improvements in the construction of portable buildings and other structures. —November 5.
676. William Edward Newton, of the Office for Patents, 66, Chancery-lane, for improvements in the manufacture of the carbonates of soda.—November 8.
686. Nelson McCarthy, of Cork, for improvements in boots and shoes.—November 9.
690. James C. Booth, of Philadelphia, for manufacturing chromate and bichromate of potash from chromic iron or chrome ore.—November 9.
692. William Edward Newton, of the Office for Patents, 66 Chancery-lane, for improvements in the construction of axles or axletrees.—November 9.
714. Henry Huart, of Cambrai, France, for improvements in the storing and preservation of grain.—November 11.
722. George Kendall, of Providence, America, for certain improvements in apparatus to facilitate the manufacturing of mould candles.—November 12.
739. Amory Hawkesworth, of Abbey-road, Torquay, for improvements in life-boats.—November 13.
768. John Wheeley Lea, of Worcester, and William Hunt, of Stoke Prior, for improvements in utilizing the waste heat of coke furnaces.—November 16.
793. John Robert Johnson, of Hammersmith, for improvements in the manufacture of type or raised surfaces for printing.—November 19.
806. William Dray, of Swan-lane, for improvements in machinery for crushing, bruising, and pulverizing.—November 20.
815. John Wheeley Lea, of Worcester, and William Hunt, of Stoke Prior, for improvements in the manufacture of iron.—November 22.
816. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in the manufacture of paper,—being a communication.—November 22.
828. Michael Leopold Parnell, of Little Queen-street, Holborn, for an improvement in the construction of box-staples and striking-plates.—November 23.
832. John Beale, of East Greenwich, for an improved arrangement of steam-engine, and an improved packing to be used therein.—November 23.
882. Antonio Fedele Cossus, of University-street, for improvements in lubricating apparatus.—November 26.
884. Robert Barnard Feather, of Liverpool, for improvements in the construction of ships, and in rendering ships and boats impervious to shot.—November 26.

CELESTIAL PHENOMENA for April, 1853.

D.	H.	M.	
1			Clock before the ☉ 3m. 55s.
	—		☽ rises 2h. 48m. M.
	—		☽ passes mer. 6h. 33m. M.
	—		☽ sets 10h. 19m. M.
	1	8	♀ greatest hel. lat. S.
3	2	2	♃'s first sat. will im.
5			Clock before the ☉ 2m. 44s.
	—		☽ rises 5h. 3m. M.
	—		☽ pass mer. 10h. 1m. M.
	—		☽ sets 3h. 9m. A.
6	12	4	♂ in conj. with the ☽ diff. of dec. 4. 26. N.
7	0	23	♀ in conj. with the ☽ diff. of dec. 3. 45. N.
8	2	46	☿ in conj. with the ☽ diff. of dec. 7. 41. N.
	11	57	Ecliptic conj. or ● new moon
9	11	23	♅ in conj. with the ☽ diff. of dec. 3. 21. N.
10			Clock before the ☉ 1m. 19s.
	—		☽ rises 6h. 23m. M.
	—		☽ pass mer. 1h. 33m. A.
	—		☽ sets 8h. 57m. A.
	3	56	♃'s first sat. will im.
	5	4	♃ stationary
	9	2	♄ in conj. with the ☽ diff. of dec. 0. 53. N.
	13	53	☿ in inf. conj. with the ☉
11	0	49	♃'s second sat. will im.
	8	0	☽ in Apogee
14	10	29	☿ in conj. with ♀ diff. of dec. 2. 46. N.
15			Clock before the ☉ 0m. 0s.
	—		☽ rises 8h. 53m. M.
	—		☽ sets 5h. 30m. A.
	—		☽ pass mer. 1h. 14m. M.
	—		Mercury, R. A., 1h. 4m. dec. 8. 0. N.
	—		Venus, R. A., 1h. 8m. dec. 5. 48. N.
	—		Mars, R. A., 0h. 32m. dec. 2. 36. N.
	—		Vesta, R. A., 4h. 12m. dec. 18. 47. N.
	—		Juno, R. A., 4h. 4m. dec. 10. 59. N.
	—		Pallas, R. A., 14h. 32m. dec. 20. 22. N.

D.	H.	M.	
15			Ceres, R.A., 14h. 48m. dec. 3. 35. S.
	—		Jupiter, R. A., 17h. 35m. dec. 22. 44. S.
	—		Saturn, R. A., 3h. 3m. dec. 15. 14. N.
	—		Uranus, R. A., 2h. 21m. dec. 13. 41. N.
	—		Mercury pass mer. 23h. 24m.
	—		Venus pass mer. 23h. 34m.
	—		Mars pass mer. 22h. 57m.
	—		Jupiter pass mer. 15h. 58m.
	—		Saturn pass mer. 1h. 29m.
	—		Uranus pass mer. 0h. 47m.
16	4	45	☽ in □ or first quarter
17	2	3	Pallas oppo. to the ☉ intens. of light 1·163
18	3	23	♃'s second sat. will im.
	18	35	☿ in the descending node.
19	0	18	♃'s first sat. will im.
20			Occul. γ Virginiis, im. 6h. 55m. em. 8h. 5m.
	—		Clock after the ☉ 1m. 9s.
	—		☽ rises 2h. 49m. A.
	—		☽ pass mer. 9h. 47m. A.
	—		☽ sets 4h. 7m. M.
22	22	45	☿ stationary
23			Occul. μ Librae, im. 17h. 14m. em. 18h. 1m.
	—		Juno greatest hel. lat. S.
	1	55	☿ in conj. with ♂ diff. of dec. 0. 19. S.
	3	12	Ecliptic oppo. or ○ full moon
	21		☽ in Perigee
25			Clock after the ☉ 2m. 9s.
	—		☽ rises 10h. 7m. A.
	—		☽ pass mer. 1h 21m.
	—		☽ sets 5h. 53m. M.
26	2	12	♃'s first sat. will im.
	12	19	♃ in conj. with the ☽ diff. of dec. 0. 56. N.
27	14	52	Vesta in conj. with Juno, diff. of dec. 7. 28. N.
	21	4	Ceres in oppo ☉ intens. of light 1. 18.
28	10	13	♅ in conj. with the ☉
	22	25	☿ in Aphelion.
29	0	58	♃'s third sat. will em.
30	6	51	☽ in □ or last quarter

J. LEWTHWAITE Rotherhithe.

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No. CCLVII.

RECENT PATENTS.

To John Wright *and* Edwin Sturge, *of the Cornwall-road, Lambeth, in the county of Surrey, engineers, for improved machinery for the manufacture of envelopes.*—[Sealed 1st October, 1852.]

This invention relates to a novel arrangement of machinery, by the use of which the manufacture of envelopes will be greatly facilitated, and a considerable economy will be effected, owing to the great regularity in the operation of the machine.

In Plate IX., fig. 1, shews, in sectional plan, a machine calculated to manufacture four sizes of envelopes simultaneously; fig. 1, is a sectional elevation, taken in the line 1, 2, of fig. 1; and fig. 3, is a longitudial section of the machine, taken in the line 3, 4, of fig. 1. *a, a,* is the main framing, supporting at its upper part a table *b,* which carries the creasing and folding boxes. These boxes are respectively set immediately over an opening in the table, to admit of the ascent of a pressing-plate, in the manner and for the purpose to be presently explained. Each box is bolted firmly to the table, and is composed mainly of two circular plates *c,* and *d*; the upper one of which is cut away at the middle to the form corresponding to that of the paper intended to be supplied through that opening to the box, for the purpose of being converted into envelopes; while the lower plate has a central opening, corresponding to the form and size of the envelope required to be made. These plates *c,* and *d,* are secured together by pins, which form the arbors for guide-rollers *e, e,* (see the detached view, fig. 4,) and they are set at such a

distance apart, as to allow of the free revolution of the rollers. Between these rollers *e, e,* four sliders *f, f,* (whose office is to turn over the lappets of the envelopes) are placed. Motion is communicated to these sliders by means of an annular plate *g*, mounted on antifriction rollers *h, h,* immediately under the box, and concentric therewith. This plate is provided with four excentric slots (as shewn in the detached view, fig. 5,) and itself receives a reciprocating axial motion. From the lower face of each slider *f*, a pin projects downwards, and carries an antifriction roller, which works in the slots of the plate *g*; radial slots (as shewn by dots in fig. 4,) being made in the plate *d*, to admit of the insertion of the pins into their respective excentric slots. On the periphery of the plate *g*, a segment rack *i*, is fixed, into which a straight rack *k*, extending across the machine, gears. This rack *k*, is actuated by means of a reciprocating segment rack *l*, carried by a vibrating arm *m*, which is keyed to a rocking shaft *n*. A slot is made in the table *b*, to receive the rack *k*, and guide it in its backward and forward motions; and also to allow of teeth on its under side projecting through the table, and gearing into the segment rack below. Besides the lines of teeth already mentioned, this rack is provided with a second line of lateral teeth, to allow of its working the segment rack-plates *g*, of folding boxes, situate on both sides thereof. Each pair of boxes is provided with a frame for carrying plungers, whose duties are respectively to crease and press the envelope. These frames are composed of an upper and lower cross-head *o*, *o**, connected together by rods *p, p,* which slide in journals provided for them in the table. The vertical position of the frame, during its up and down movements, is ensured by the continuation downwards of the rods, as shewn at *p**, *p**; such continuations working in journals, carried by brackets *q, q,* affixed to the main framing. *r*, *r**, are plungers, attached to their respective cross-heads, and intended, the upper ones *r*, to drive down the paper, which is supplied to the machine, into the recess or central opening in the plate *d*; and the latter, to raise a swinging-plate *s*, suspended below the table *b*, and press that plate against the folded envelope. These plates *s*, are respectively carried by a pair of weighted arms *t, t,* which swing in slotted bearings *u*, bolted to the under side of the table *b*; and they thus receive a tendency to retain an elevated position. Their depression at the time that a folded envelope is ready to be discharged from the box, is ensured by means of the lower plungers *r**. These plungers, it should be understood, in their ascent, drive up the plates *s*, and cause

them to press upon the folded envelope, over which the slides *f*, have closed; but, as they descend, they strike against a bent wire or stop-piece of the plates *s*, and thereby draw them down and allow of the discharge of the envelopes.

The vertical movements of the plungers are obtained in the following manner:—Keyed to opposite ends of the shaft *n*, are levers *v*, *v*, which are connected by links *w*, *w*, to the plunger-frames; consisting of the cross-heads and connecting rods *o*, *o**, and *p*, *p*. On the shaft *n*, an arm is keyed fast; and this arm is, by means of a rod and crank, connected to the main driving-shaft, which receives rotary motion through a driving-strap and pulley from any first mover. When, therefore, the driving-shaft is made to rotate, it will, through the crank and connecting-rod, and the arm on the shaft *n*, cause that shaft to rock, and vibrate the levers *v*, *v*; which levers, through the connecting-links *w*, *w*, will raise and depress the two plunger-frames alternately.

In order to gum the paper before it is folded, the following contrivance is adopted:—Below each box is a branch fountain-tube 1, (see the detached view, fig. 6,) which conveys a gummy solution to two channels or slots cut in the plate *d*, and keeps them constantly full during the operation of the machine. These slots are so arranged as to guide the gum in a proper direction to that lappet which is to be first folded over. To ensure the contact of the paper with the gum, a presser is employed, to press down that portion of the paper which lies over the slots. This action must be performed immediately before the descending plunger *r*, reaches the paper to effect the creasing; and, to ensure its timely performance, motion is communicated to the presser by a stud, projecting from the rod of the plunger *r*, striking against a latch carried by the presser-rod. In fig. 2, this pressing apparatus is shewn in elevation. To the plate *c*, is bolted a bracket 2, which carries a spring-box 3, containing a helical spring. This spring surrounds the upper end of a pressing-rod, which thereby receives a tendency to keep in an elevated position. To the lower end of this rod two elastic cushions or pressing-pieces are loosely attached,—a helical spring being interposed between them and the rod, to allow of their yielding to undue pressure. The pressing-rod is fitted with a latch, which is capable of sliding in its guide, and, by means of a pin, projecting from the latch into a slot formed in the bracket 2: this latch will be drawn back, clear of the stud of the plunger, when the requisite pressure has been put on that part of the paper which lies over the slots or gum channels in the plate *d*; and, when clear

of the stud, the rod will suddenly rise to its former elevation, by reason of the expansive force of the helical spring in the spring-box.

It will now be understood that paper is fed to each box when the top plunger is raised, and that the descent of that plunger will first cause the gumming of the paper, by means of the apparatus just explained; and will then force the paper into the central opening in the plate *d*, and thereby crease it to the size of the envelope. By this action the lappets will be thrown up, and the slides *f*, will now advance to turn them over,—the plunger *r*, rising in the meantime to permit of this action.

It should here be remarked, that it is important to the proper folding of envelopes that the lappets shall follow each other in a given relative order, and that they should fold over without buckling or creasing. To ensure these conditions the sliders in this machine are arranged in the manner shewn at fig. 4; so that they commence to act upon the paper at the ends of the creases instead of the middle of the lappet, as is the common practice in envelope folding-machines; and they are so shaped that each slider will act upon two lappets. This shape is further controlled, so that those portions of the inner ends, or acting edges of the sliders which are intended to turn over the gummed lappet, shall act first; then those parts which turn over the side lappets; and, lastly, those which turn over the lappet which usually carries the wafer, crest, or seal. As the top plunger rises, the rack *k*, by means of the vibrating segment rack *l*, on the rocking shaft *m*, is made to drive round the plate *g*, the excentric slots of which, by acting on the antifriction rollers of the sliders, are made to draw the sliders inwards, and fold over the lappets of the envelope. The lower plunger now rises, and forces up the swing-plate *s*, into contact with the envelope, whereby it is compressed and rendered fit to be discharged from the machine. The discharge is effected, as before stated, by the descent of the lower plunger bringing down the swing-plate *s*, and opening a passage for its escape. Simultaneously with the descent of the lower plunger is the descent of the upper, to repeat the action of creasing; the attendants have therefore to feed each box immediately on the discharge of the finished envelope therefrom. When the pressure is taken off the envelope, the axial motion of the plate *g*, is reversed, and the sliders are thereby drawn back, ready to repeat the folding action on the next charge of paper. On reference to fig. 5, it will be observed, that the extremities of the grooves in the plate *g*, are made con-

centric;—this is for the purpose of rendering the sliders quiescent when both the pressing and the gumming operations are being performed. To ensure the proper degree of pressing, the bottom plungers are fitted with set-screws, the elevation or depression of which will determine the degree of pressure to be put upon the swing-plate, and by that to be transmitted to the envelope.

The patentees claim, First,—the general arrangement of the machine, as above described and shewn in the drawings. Secondly,—the mode of constructing and arranging the sliders, as shewn in the drawings; whereby the folding over of the lappets of the envelope, in their proper consecutive order, is ensured. Thirdly,—connecting the upper and lower plunger together, so as to ensure their alternate action upon the envelope, for creasing and pressing the same. Fourthly,—the use of the swing-plate which supports the paper or other material while being folded, and, through the action of the lower plunger, presses the envelope, and effects its discharge from the machine. And, Lastly,—the means above set forth, whereby the sliders of several boxes are actuated by one reciprocating rack.

To Matthias Walker, *of Horsham, in the county of Sussex, ironmonger, for an improved ash-pan, or apparatus for taking up ashes and cinders, and separating or sifting them.*—[Sealed 1st October, 1852.]

This invention consists in fitting a deep pan or box with an inclined partition, made of metal bars or wire work, so as to act as a sieve.

The figure in Plate IX., shews the pan or box in vertical section. *a, a,* is the box, divided into two parts A, B, by a perforated or wire-work partition or grating *b, b;* one extremity of which is fastened to one end of the box, and near the bottom, and the other to the fixed part *c,* of the cover. A moveable cover or lid *d,* is hinged to the fixed part *c,* and covers up the compartment A; and a similar lid *e,* is adapted to the opposite end of the box for the part B. The apparatus may be carried about by a swinging handle *f;* and there are other handles *g, g,* one at each end, for the convenience of shaking the apparatus when required. The cinders and ashes are put into the compartment A, and the lid is then closed. To separate the cinders from the ashes and fine dust, the box is tilted, by means of one of the handles *g, g,* so as to throw

the cinders, ashes, and dust, against the inclined grating; and, on slightly shaking the box, the fine dust and smaller particles will fall through the grating, into the other compartment B, on the other side of the partition,—leaving the cinders and larger pieces behind. In order to prevent the dust from mixing again with the large cinders, a strip of metal, about an inch and a half or two inches wide, may, if required, be fixed along the lower part of the wire-work partition, so as to retain the dust in its compartment, until it can be discharged by opening the cover of the compartment B, and inverting the box. The dust will thus fall out while the cinders are retained in the box, for the purpose of being used as fuel.

The patentee describes a modification of this dust-pan, which is somewhat cheaper in construction than that just explained. In this the hinged lids or covers are dispensed with, and in lieu thereof a sliding-cover is adopted, which may be slidden in either direction, so as to uncover either the compartment for the cinders, or that which holds the dust. Stops are fixed underneath the cover, to prevent it from being slidden too far either way.

The patentee claims, as his invention, an improved ash-pan or apparatus for taking up ashes and cinders, and separating or sifting them; which apparatus consists principally of a box or pan, divided into two compartments by an inclined grating or perforated partition, so arranged, that upon throwing the cinders and dust into the box at one end, the large cinders will become separated from the small dust, which will pass through the grating or perforated partition.

To Henry Smith, *of Stamford, agricultural implement maker, for improvements in reaping-machines.*—[Sealed 1st October, 1852.]

This invention relates to certain novel arrangements of mechanism, designed, first, for the purpose of gathering in or bringing up, to the action of cutting-tools or knives of reaping-machines, corn or other standing crops which are required to be reaped; secondly, for cutting the same, when properly presented; and, thirdly, for effecting the discharge of the reaped produce in given quantities, at intervals, instead of continuously.

The mode of effecting these objects is shewn in several views in Plate X. Fig. 1, is a plan view of a reaping-machine, constructed according to this invention; fig. 2, is a

longitudinal sectional elevation, taken in the line 1, 2, of fig. 1; and fig. 3, is a partial cross section, taken in the line 3, 4, of fig. 1. In these figures, *a, a,* is a rectangular framing, for carrying the driving gear; and to it the draught horses are attached. *b,* is a large running-wheel, on the axle of which a cog-wheel *c,* is also mounted; and into this wheel a pinion *d,* keyed to a horizontal shaft *e,* gears. This shaft *e,* turns in journals, carried by the main framing *a,* and serves as an axle for a set of speed-pulleys *f,* and a bevil-wheel *g.* Gearing into the bevil-wheel *g,* is a bevil-wheel *h,* which is keyed to a vertical shaft *i,* having its bearings in a bracket and cross-piece, attached to the framing *a.* This shaft terminates in a square socket, which fits loosely on to a square spindle, forming the axle for a chain-pulley *j,* which lies in the line of a series of star-shaped knives *k,* and is intended (through the medium of an endless chain *l,*) to give motion to the same when rotated by the shaft *i.* Attached to the framing *a,* is the frame *n,* of a platform or table *m,* for receiving the reaped produce. A segment-slot is made in the fore part of the frame *n,* of this table, to receive a screw-bolt, which projects from the framing *a,* and, by means of a binding nut, holds the two frames together, in any required relative position: the frame is supported at its other side by means of a running-wheel *n**. In front of the adjustable platform or table *m,* the knives *k,* are set. The mode of mounting them is shewn best in the detached cross sectional view, fig. 4. *o,* is a plate, extending across the front of the platform, and secured at both ends to the frame *n*: its forward end is turned up at right angles, and thus it forms a kind of box, suitable for receiving the chain *l,* and the chain-wheels *p,* which gear into the links thereof, and prevent these parts from being clogged by the indraught of straw or weeds. The chain-wheels *p,* are secured to studs, which form the axles of the knives *k*; and they are arranged at such distances apart, that the knives will lap over each other, and thereby present a continuous cutting surface to the crop. Immediately above the rotary knives a straight blade *q,* is fixed, forming an edge for the knives to cut against: this blade is bolted to a plate *r,* which is itself firmly secured to the forward edge of the platform *m.* *s, s,* are fingers, which precede the knives, for the purpose of guiding the corn or other produce up to them, and of assisting in retaining it while the cut is being effected. These fingers have a return flange, which passes under the plate or box *o,* and is firmly secured thereto by bolts. The chain *l,* passes from the pulley *j,* in a zigzag direction, over the chain-wheels *p,* to the end

wheel p^*, which is made somewhat larger in diameter than the wheels *p*, in order that it may return the chain in a direct line to the pulley *j*. The platform-frame *n*, is provided at the side nearest the driving gear with a shield *t*; the object of which is to raise any of the standing crop that may have been "laid" or beaten down by rain, wind, or other casualty, and to hold it up to the proper action of the knives, whereby the loss occasioned by the severing of the ears of corn from the stem will be, in great part, avoided. This shield is made of thin sheet-iron, and has somewhat the appearance, in plan view, of the mould-board and share of a common plough;—its forward point, which precedes the cutters, being bent down towards the ground, and its hinder part rising to a line a little above the line of the rotary knives. Fitted to the under side of this shield is a roller, which runs along on the ground for the purpose of preventing the point of the shield from entering the ground when it meets with a ridge or mound of earth. To allow of the point of the shield rising and falling, according to the irregularities of the surface, the shield may be jointed, as shewn at fig. 2. If thought desirable, a shield may also be fitted to the other side of the frame *n*. Situate above the forward end of the platform *m*, is a reel or set of rotating arms *u*, for gathering in the standing corn, and bringing it into contact with the knives, and afterwards laying the corn, when cut, upon the platform. This reel has a hollow axle, which is supported by a central rod *v*, affixed to and projecting at right angles from a fixed perpendicular shaft *w*, which forms a support for a hollow axle *x*. Both extremities of this axle *x*, are provided with bevil-pinions, which gear respectively, the one into a pinion on the hollow axle of the reel, and the other into a pinion keyed to a short shaft *y*. On this shaft *y*, a set of speed-pulleys is mounted, and a band passes from these to the pulleys *f*, on the shaft *e*. As, therefore, this shaft *e*, is rotated by the revolution of the running-wheel *b*, caused by the forward progress of the machine, the pulleys *f*, will give rotary motion through the pulleys *z*, to the shaft *y*, which, through the bevil gearing at the opposite ends of the shaft *x*, will cause the reel or arms *u*, to revolve and sweep the corn, as it is cut, on to the platform. This movement of the reel will take place simultaneously with the rotation of the knives, which are driven, as has already been explained, by transmitting the rotary motion of the shaft *e*, to the spindle of the chain-pulley *j*.

Supposing the corn, under operation, to be gathered in by

the rotating reel, and laid upon the platform, it is required to discharge the cut corn at intervals, in order that it may be gathered up with ease and bound into sheaves. This is effected either through the medium of a second or tail platform, which will admit of the produce being discharged laterally, or by causing it to fall directly on to the ground from the back end of the platform *m*. For this purpose (whether the tail platform be used or not) the patentee mounts, at the hind end of the platform *m*, a roller 1, the axle of which passes through the two frames *n*, and *a*, and connects them together; and to this roller an intermittent axial motion is given by the following means:—On the hollow axle *x*, (see figs. 1, and 2,) a cam 2, is mounted, and embracing this cam is one end of a double-forked lever 3, which rocks on a centre-pin 4, carried by a bracket from the framing *a*. The other end of this lever embraces a driving-strap 5, which passes over a fast and loose pulley 6, and thence to a fast and loose pulley 7, on the shaft of the roller 1. The fast and loose pulleys 6, are mounted on a shaft 8, supported in bearings on the framing *a*, and driven by a pinion 9, on that shaft, gearing into the cog-wheel *c*, on the axle of the running-wheel *b*. When therefore the strap is upon the fixed pulleys, the roller 1, will rotate; but when thrown off either of these pulleys, the axial motion of the roller will be suspended. This will take place once for every revolution of the axle *x*, which, by bringing the cam 2, to bear against one or other of the friction-bowles of the lever 3, will cause that lever to rock and shift the position of the driving-strap on the pulleys 6.

In order to admit of the adjustment of the knives to any given height from the ground, the following contrivance is provided:—10, 10, is a rocking cranked rod, supported in bearings on the framing *a*, and extending from one side to the other of the frame *u*, under the platform. This rod serves to carry a bent arm 11, which is fixed firmly thereto, and forms the axle for the small running-wheel *n**. At its opposite end this rod carries a lever 12, to which a rod 13, having a threaded end, is jointed. The threaded end of this rod 13, passes through an eye, fixed to the framing *a*, and it is provided with a tightening nut. When, therefore, it is required to let down the knives to a lower level, the binding-nut, which secures the frames *a*, and *n*, together at their forward end, is first loosened, and the nut on the rod 13, is then slackened. The forward end of the frame *n*, together with its platform and knives, will then drop (turning on the axle of the roller 1, as its centre of motion) in a degree proportion-

ate to the traverse of the nut on its rod. When the knives have attained the required level, the binding-nut, on the connecting-bolt at the fore part of the frames, is screwed up tight, and the two frames are held firmly together. In order to elevate the knives it is only necessary to loosen this nut, and to draw up the rod 13, by means of its nut. This movement of the rod 13, will cause the cranked rod 10, to rock in its bearings in the framing *a*, and thereby lift the frame *n*, with its platform and knives,—the top of the wheel *n**, acting as a bearing for the extremity of the cranked rod, of which the fixed lever 11, may be considered as a continuation. It will be understood, that as the elevation of the platform is capable of being increased or diminished, it will be necessary to provide means for the proper action of the reel under all circumstances. To effect this, the arms of the reel are made capable of elongation and contraction, by reason of the slot and bolt arrangement, shewn at fig. 2. To allow of the axle of the reel being raised and lowered, the hollow axle *x*, is formed in two parts, which lock together; and between them a short piece of tube, as at *x**, fig. 2, may be inserted, to elevate the axle of the reel. The top bevil-pinion of the axle *x*, will thus be raised, and the shaft *v*, which carries the hollow axle of the reel, may be fixed to the shaft *w*, in such a position as to ensure the proper action of the bevil-pinions of the two hollow axles.

Fig. 5, shews, in end elevation, a mode of effecting a side delivery of the corn or other cut produce. *a*, *a*, is a second platform, which is attached to the frame *n*, of figs. 1, and 2, immediately behind the roller 1, and at a lower level than the platform *m*. As therefore the cut produce collects on the platform *m*, it is discharged by the intermittent action of the roller 1, on to the tail platform *a*. The patentee remarks, that in place of the fixed inclined platform *m*, he may sometimes employ an endless travelling cloth or travelling bands, actuated by the roller 1, and so made to discharge the produce at intervals, either on to a second platform or on to the ground. The tail platform *a*, is supported by running-wheels *b*, *c*; from the former of which the motion is obtained for actuating the sweeps or rakes, to be presently mentioned. *d*, *d*, *d*, is a rigid frame, extending above and around the platform, for the purpose of carrying the shafts of the rakes and the parts for actuating the same. *e*, is a horizontal shaft, supported in suitable bearings above the platform; and keyed thereto are the arms of a pendent rake *f*, which is intended to sweep the cut produce forward from the side towards the

middle of the platform. *g*, is a horizontal shaft, also working in bearings at the upper part of the frame *d*, and carrying a second rake *h*, which will take the cut produce from the middle of the platform and discharge it on to the ground. These movements of the rakes are effected in the following manner:—The shaft *g*, carries a fast and loose pulley *i*, from which a driving strap proceeds to a drum *k*, mounted on a short shaft *l*, which carries a bevil-pinion *m*, in gear with a bevil-wheel *n*, on the axle of the running-wheel *b*. As, therefore, the machine is drawn forward to cut the corn or other produce, the wheel *b*, will rotate, and cause the revolution of the shaft *g*, with its rake *h*. On the shaft *g*, a cam *o*, is mounted; and bearing against this cam is the short arm of a rocking lever *p*, which is supported by a stud from the frame *d*. The other end of this lever is furnished with a friction-roller, which bears against an arm *q*, keyed to the shaft *e*. The rotation, therefore, of the shaft *g*, will, by means of the cam *o*, cause the rocking-lever *p*, to throw up the arm *q*, whereby the rake *f*, on the shaft *e*, will be driven forward. When the longest radius of the cam has passed the end of the lever *p*, the longer arm of that lever will descend, and the rake *f*, will then be free to fall back to its quiescent position.

The patentee claims, First,—the arrangement of fixed and rotary knives or cutting edges, for cutting corn and other standing crops; and also the mode of working the rotary knives, as above explained. Secondly,—the use of a shield or shields, as explained, for raising the "laid" corn or other produce, and bringing it under the action of the knives. Thirdly,—effecting the discharge of the cut produce from the platform *m*, or its equivalent, by means of a roller whose action upon the cut produce shall be intermittent. Fourthly,—the means whereby the elevation of the knives is adjusted. Fifthly,—the mode of mounting and constructing the reel to admit of its adjustment and radial expansion, as above explained. And, Lastly,—the application to reaping-machines of the reciprocating and rotary rakes for effecting the lateral discharge of the cut produce from such machines.

To George Henry Brockbank, *of Crawley-street, Oakley-square, for improvements in upright piano-fortes.*—[Sealed 1st October, 1852.]

This invention consists in applying to upright piano-fortes an additional wrest-plank in front of the ordinary one, to-

gether with metal bars, and causing the wrest-pins to pass through and rest within the additional wrest-plank, as formerly.

In Plate X., fig. 1, is a front view of a wrest-plank, through which the wrest-pins pass; and fig. 2, is a transverse section of the two wrest-planks. *a*, is the ordinary wrest-plank, in which the wrest-pins are placed; and *b*, is the additional wrest-plank, through which the wrest-pins pass, and within which they rest, as is shewn, for the purpose of more effectually resisting the strain or pull of the strings. *c*, *c*, are metal bars, to receive and resist the pressure of the additional wrest-plank *b*.

The patentee claims the application of an additional wrest-plank in front of the ordinary wrest-plank, together with metal bars; and causing the wrest-pins to pass through and rest within the additional wrest-plank, so that the strings pass between the two wrest-planks.

To WILLIAM SMITH, *of Kettering, agricultural implement maker, for improvements in machinery or apparatus for cleaning currants, raisins, and other fruits or vegetable substances.*—[Sealed 1st October, 1852.]

THIS invention relates to a novel arrangement of machinery to be used chiefly for removing extraneous matters from dried fruits, such as raisins, currants, &c.

In Plate IX., fig. 1, is a vertical section, taken near the middle of the machine; and fig. 2, is an elevation, partly in section, taken at right angles to fig. 1. *a*, *a*, is the main frame of the machine, carrying, at its upper part, a driving-shaft *b*, which is mounted in suitable bearings *c*, *c*. Set over the shaft, and firmly secured by bolts to the main framing, is a hopper *d*, in which the fruit to be cleaned is thrown. This hopper is provided with a fixed inclined table *e*, for guiding the fruit on to a fluted or corrugated roller *f*, which is keyed to the shaft *b*, and works in the bottom of the hopper. On the opposite side of the hopper to that against which the inclined table *e*, is fixed, is an adjustable brush *g*, which bears against the fluted roller and forms a yielding stop-piece, to prevent the fruit from being carried too rapidly out of the hopper by the rotary motion of the roller *f*, and yet avoid the crushing of the fruit, by reason of the resistance to its descent which would take place if the stop-piece were composed of any rigid unyielding substance. Below the hopper is a wire-gauze casing *h*, which receives the fruit as it

falls from the hopper. The form of this casing is that of the frustrum of a cone inverted, but it may be made cylindrical, if thought desirable. Through the centre of this casing *h*, passes a shaft *i*, which rests in a step *j*, bolted to the underside of the table *k*, and is supported, in a vertical position, by means of a bracket-bearing *l*. This shaft carries a brush *m*, the periphery of which corresponds to the form of the wire-gauze casing, but its bristles are arranged in a spiral form, that they may the better act upon the fruit, and carry it down and discharge it (after it has been disengaged of any refuse matters, as stones, &c., that may be mixed threwith) through the open bottom of the casing, into a drawer or other proper receptacle *n*.

To ensure the proper action of the brush upon the fruit, tufts of bristles *m**, are inserted between the coils of the brush, which will intercept the fruit in its descent, and drive it outwards under the action of the spiral line of bristles. Rotary motion is communicated to the brush through a spur-wheel *o*, keyed on to the driving-shaft *b*, and gearing into a spur-pinion *p*, keyed on the shaft *i*,—the driving-shaft *b*, being itself rotated by a hand-wheel *q*, or other suitable contrivance. The action of the machine is as follows:—Rotary motion being communicated to the shaft *b*, and the hopper being supplied with, say, dried currants, the fluted roller *f*, will be caused to drive forward a certain quantity of the currants, and pass them out of the hopper,—the amount being determined by the dip or position of the fixed brush *g*. The currants will then fall upon the rotating spiral brush *m*, and will be carried down an inclined plane of bristles; but, by reason of the rapid rotation communicated to this brush, a powerful centrifugal action will be set up among any loose matters entering the case *h*, and thereby the currants will be thrown with violence against the inner periphery thereof; and any heavy matters, such as stones, chips, grit, &c., which may be mixed with the currants, will be driven through the meshes of the wire gauze; or, if any pieces are caught therein, the elastic force of the bristles will effect their discharge. The currants, by reason of the spiral winding of the bristles, will descend slowly in a continuous stream, and thereby a better opportunity will be provided for the discharge of the extraneous matters than if the currants were allowed to fall through the casing by their own gravity. When they have arrived at the lower end of the casing, they are free to fall into the drawer or box *n*; but the refuse matters, discharged through the meshes of the casing, will fall on to the table *k*, whence they may be swept off.

The patentee claims, First,—the adjustable retaining-brush, for regulating the discharge of the fruit from the hopper. Secondly,—arranging the bristles or their equivalent, in a spiral form, when a conical casing is used, or helically, when a cylindrical casing is employed, for the purpose of retarding the descent of the fruit. And, Thirdly,—the combination, in one machine, of the stationary and rotating brushes, with a vertical casing or cylinder, having meshes or openings in its periphery, to admit of the discharge of extraneous matters from the fruit under operation.

To FREDERICK OSBOURN, *of Albion-street, King's Cross, tailor, for a machine or apparatus for facilitating the manufacture of various kinds of garments or wearing apparel.* —[Sealed 1st October, 1852.]

IN the manufacture of such garments as coats, vests, and trousers, it is usual, after taking the measure, to cut out paper or cardboard patterns of the various parts of the garment; and, by the assistance of these patterns, to mark out with chalk or color, on the cloth that is to form the garment, the shape of the several pieces of which the garment is to be composed. It has been found, by experience, that it depends greatly upon the care and judgment of the workman who draws out the pattern, whether the material is economically or otherwise used.

Now, the object of the present invention is, by means of suitable apparatus and a skilful arrangement of the pattern-pieces, to carry on this business in a more methodical manner, and, at the same time, to effect a considerable economy in the consumption of the cloth or fabric intended to be worked up into garments, without the necessity of employing skilled and, therefore, expensive labor.

To this end the patentee first prepares a pattern, on which all the several parts of any garment (say, for instance, a coat) are skilfully combined in such a manner as to form only one piece; leaving as little waste material as possible between the several parts of the pattern.

In Plate X., fig. 1, represents the pattern of the several parts of a coat, arranged in this manner on a sheet of cloth or other material. The outline of the pattern is formed by holes perforated through the sheet, and powdered chalk is dusted through the holes; or the pattern may be marked thereon by means of some liquid coloring matter, such as

whiting or chalk and water, laid on the surface of the perforated pattern with a sponge or brush. If thought desirable, a series of these patterns may be connected together in a continuous length, so as to extend from end to end of the table upon which the cloth to be operated upon is placed.

The pattern is placed flat upon the fabric intended to be cut up to form garments, and the powdered chalk is then dusted through the perforations; after which an unskilled workman can, by following the outlines thus produced, cut out the several pieces, which may then be made up or sewed together, in the ordinary manner, to form a garment. In order further to facilitate the manufacture of garments on an extensive scale, the inventor employs the machine shewn in longitudinal vertical section at fig. 2. *a, a,* is a box, in which the cloth to be operated on is to be placed; *b, b, b,* is the long table on which it is smoothly spread out to receive the perforated pattern. One end of the cloth is secured to a web or to straps, tapes, or bands, which pass over the roller *c,* to the beam *d,* below the table. On the axis of this beam is a toothed wheel, which is geared into by a pinion on the axle of the winch-handle shaft *e.* Sometimes it will be found convenient to secure the cloth to a long web *f, f, f,* as shewn in the figures. This web is wound on a beam *h,* at the left-hand end of the apparatus, and passes along the table *b, b,* under the roller at the opposite end to the cloth-beam *d,* on which it will be wound with the cloth. One edge of this web *f, f,* is to be marked with figures, which denote yards, so that it may be seen, at a glance, how much cloth has passed over the table.

The operation of the machine is as follows:—Upon rotating the shaft *e,* the web *f,f,* to which the cloth is secured, is wound on the beam or cylinder *d,* below the table, and, at the same time, a portion of cloth is drawn out of the box *a,* and is laid smooth on the table *b, b.* The workman then takes the pattern, shewn at fig. 1, or any other analogous pattern, according to the kind of garment intended to be produced, and, after placing it on the cloth, marks all the lines thereof on the cloth, as above explained. This having been done, the workman next shifts the pattern to another portion of the cloth, and makes a repeat of the pattern; continuing the same until the whole length of the cloth on the table has been marked. If, however, the pattern is repeated several times on a sheet, extending from end to end of the table, the shifting operation may be dispensed with, and time may be economized. The whole length of cloth spread out on the table, having been

marked with the pattern, the cylinder *d*, must be turned, and a second quantity of cloth will be drawn from the box *a*, on to the table, and may be operated upon in the same manner until one half of the whole length of the piece of cloth has been marked off.

Another mode of marking the pattern on the cloth is, by the use of a trough or vessel *k*, containing a liquid preparation suitable for marking the pattern on the cloth. The trough is slotted at bottom, and partially closed by a roller *i*, covered with felt, for the purpose of taking up a certain quantity of the coloring matter. The perforated pattern having been laid on the cloth, the latter, with the pattern thereon, is passed under the roller *i*; and the coloring matter from this roller, being pressed through the perforations of the pattern, the latter is transferred to the cloth. In this manner a piece of cloth may be marked in a few minutes.

The whole piece is then doubled and transferred to the "cutter," who can proceed to cut out four or more pieces at a time; the cloth having been doubled in the first instance, as usual, and doubled again in the length,—thereby making four thicknesses. By this means a great economy of labour, time, and material is effected, when large quantities of cloth are operated upon; and the patterns are not so liable to be damaged in use.

When one piece of cloth has been thus operated upon, it may either be removed on the cylinder or beam *d*, or may be unwound therefrom by means of the beam *h*, at the opposite end of the apparatus, and afterwards folded up ready to be cut into pieces.

The patentee claims, First,—arranging and connecting together all the several parts of a pattern for any particular garment, in such a manner that they may form one piece or pattern; whereby the pattern may be marked on the cloth or fabric in a more convenient and expeditious manner than heretofore. And, Secondly,—the arrangement or construction of machinery or apparatus, herein shewn and described, or any mere modification thereof, for facilitating the operation of marking patterns on cloth or fabrics.

To Thomas Wood Gray, *of Warkworth-terrace, Commercial-road, for improvements in cocks and valves.*—[Sealed 1st October, 1852.]

This invention consists, firstly, in applying hollow glass or earthenware valves, to cocks, having seats of vulcanized India-

rubber or elastic surfaces, and thereby to produce fluid-tight joints.

The second part of the invention refers to improvements in water-cocks or hydrants, and consists in forming a box or cover, which is fixed to the valve-chamber in such manner that in fixing it to the upper end of the valve-chamber the elastic seating is, at the same time, secured in its place. The stand-pipe passes through the box, and screws or fixes into the valve-chamber.

The figure in Plate X., represents, in sectional elevation, a stand-pipe, and apparatus connected therewith. *a*, is the stand-pipe, having two branches or outlets a^1; and a^2, is a screw-cover for closing one outlet, while the other is in use, as has heretofore been the case with similar stand-pipes. *b*, is the valve-chamber, with a spherical valve within it, consisting of a strong sphere of glass, blown or cast for that purpose. China or earthenware may likewise be used, in combination with vulcanized India-rubber or elastic seats, which will prevent the valves coming against hard surfaces. *c*, is the valve-seating, against which the valve is pressed by the water in the main. The valve-chamber is fixed to the water-main by screws and nuts, and the box *d*, is bolted to the upper part thereof; and, by fixing the box to the valve-chamber, the seating of vulcanized India-rubber will also be secured. The upper end of the box *d*, is closed, when out of use, by a cover d^1, which is arranged to be locked, so that no stones or dirt may get in; and holes are made through the lower end of the box to allow of the escape of any water which may find its way into the box. Cast on the interior of the box is a female screw, to receive a hollow male screw *e*, which carries the stand-pipe. Near its lower end, this pipe is furnished with a male screw, which takes into the nut *e*, and is thereby held in position. When the stand-pipe has been fixed in its place, and a hose-pipe has been fixed to one of the outlets thereof, the valve in the valve-chamber may be depressed by the spindle, which passes through a stuffing-box, and is caused to descend and press on the valve by a screw, in like manner to what has been heretofore done.

The patentee claims, First,—the application of spherical glass, china, earthen, or such like ware valves in combination with vulcanized India-rubber or other elastic seatings, arranged in cocks to be kept closed by the pressure of the fluid. Secondly,—combining the mechanical parts of a water-cock or hydrant, as herein described.

To Edward Lambert Hayward, *of the Blackfriars-road, for improvements in lock-spindles.*—[Sealed 1st October, 1852.]

This invention consists in constructing the spindle of a door-handle, so that it may be adapted to doors of different thicknesses.

In Plate X., fig. 1, is a section of part of a door, with the handles and spindle applied thereto; and fig. 2, is a view of a spindle, shewn separately. *a*, is the door; *b, b*, are the handles; and *c*, is a spindle, at one end of which is a series of holes c^1. Into one of these holes, according to the thickness of the door, the screw *d*, is inserted;—that hole being taken which will necessitate the least adjustment for bringing the handles into contact with the door. A means of nicely adjusting their position is provided at the other end of the spindle. c^2, is a slot, and c^3, a screw, which enters the slot; and against the end of this screw c^3, the screw-pin *e*, bears, when introduced in its place. It will be seen, that if the screw c^3, does not enter sufficiently into the slot, the handles would not be close up to their positions, and the same would be loose. On the other hand, if the screw c^3, is screwed too far into the slot, the screw-pin will not pass through the slot in the spindle. Hence it should be understood, that the screw c^3, is only to be screwed into the slot to such an extent as to ensure the screw-pin *e*, coming against its end,—the handles being allowed only sufficient play to admit of their turning freely.

The patentee remarks, that it is evident that in place of having the slot at only one end, a slot and screw may be used at both ends of the spindle. He claims, as his invention, the construction of lock-spindles, as above described.

To Charles John Carr, *of Belper, in the county of Derby, engineer, for improvements in machinery for making bricks and other similar articles.*—[Sealed 1st October, 1852.]

This invention relates to an improved arrangement or construction of machinery, whereby the moulding of bricks and other similar articles may be made with great facility, and of good quality, without the necessity of employing hand-labor.

In carrying out his invention the patentee states, that he has sometimes found it necessary to vary the arrangements of the parts of his machinery, according to the peculiar nature of the clay or other substance intended to be operated on, or

the description of brick or other article intended to be made; but, under all the modifications adopted, his machinery consists, principally, of a drum or wheel, mounted in horizontal bearings, and carrying, at its periphery, one or more series of moulds of any convenient and even number. On the shaft or axle of this drum is fixed a ratchet toothed wheel, which may be moved round or actuated, at stated times, by means of an arm or lever, furnished with a pawl or click, and connected to a crank or excentric on the counter-shaft. Or the mould-wheel may be made to rotate with a regular speed, instead of with an intermittent motion.

In Plate X., fig. 1, is a vertical section, and fig. 2, is a front elevation of one arrangement of the machinery,—the clay being worked and delivered into the moulds by means of rollers instead of by a pug-mill; which mode is also set forth in the drawings appended to the specification. *a, a,* is the main shaft of the machine, which is intended to be driven by steam-power; *b, b,* is a pinion, mounted on this shaft, for driving two pairs of clay-rollers *c, c,* and *d, d,* and a pair of pugging-rollers *e, e,* (shewn detached and in plan at fig. 3,) by means of the toothed wheels *f, g,* and *h,* as will be clearly understood by referring to the drawings. *i, i,* are two pairs of scrapers or doctors, for clearing the clay-rollers from any clay that may adhere thereto. A similar pair of scrapers must be adapted to the pugging-rollers *e, e*; and the edges of these scrapers must be made to fit the teeth or indentations of the pugging-rollers. These scrapers or doctors are adjustable by means of screws, as shewn in the drawings. *c*, c*,* is the hopper, into which the raw clay is fed from the clay-pit by webbing, endless cloth, or other convenient means, extending from the clay-pit to the hopper. The clay passes from the hopper between the first pair of clay-rollers *c, c,* where it is partially crushed; and from thence it descends between the pair of grooved pugging-rollers *e, e.* By forcing the clay between these grooved rollers it becomes divided up, and is delivered to the next pair, or into the channel *e**, direct in the form of a thin corrugated sheet; so that, by this means, when the clay is compressed or consolidated, it will become thoroughly mixed or pugged. These rollers may sometimes be dispensed with; and, for some kinds of clay, the grooving of the rollers *d, d,* in a similar manner to the pugging-rollers *e, e,* will prevent the necessity of more than one pair of rollers being used. The clay passes from the pugging-rollers *e, e,* between a second pair of crushing-rollers *d, d,* which should be set much closer together than the first set;

and the clay is, by these rollers *d, d,* forced down the vertical channel *e**, into one or more moulds *l, l,* which are arranged radially round the mould-wheel *m, m.* These moulds have a fixed bottom, and are also furnished with a false bottom or piston *n, n,* fixed on one end of the rods *o, o,* which pass through holes made in the fixed bottoms of the moulds. The opposite ends of the rods *o,* are provided with antifriction-rollers *p.* When the mould or moulds immediately below the channel *e**, have received their supply of clay, the mould-wheel is made to rotate by means of gearing hereafter described; and the clay contained therein is thereby cut off from the upper stratum of clay contained in the channel *e**. A fresh pair of moulds is, by the same action, brought under the channel *e**, to receive a supply of clay; and the former pair passes under the curved plate *q,* to a pressing-roller *r;* which being made, by the force of a strong spring (as shewn in the drawing), to bear on the surface of the clay in the mould, will press down and consolidate the clay therein, and force it into all the vacant or unfilled spaces of the mould. The pressing-roller *r,* runs on the edge of the end-plates of the mould-wheel, which, at the ends of the moulds, are filed down flat, so as to allow the roller *r,* to press on the clay in the mould. The onward progress of the mould-wheel will next bring the first pair of moulds under a scraper *s,* which will remove any superfluous clay therefrom, and make the exposed surface of the brick smooth. It will be understood, that the mould-wheel *m,* moves periodically,—it being stationary while the moulds are being filled and emptied; and, as the mould-wheel *m,* from time to time, moves onward, the full moulds are, in turn, brought to the under side, as at *l**, when one end of a pair of levers *t,* is made to descend and force down the antifriction-roller *p,* at the end of the rod *o,* of the piston *n,* and thereby push out from the mould the newly-formed brick, which will be deposited on the endless cloth or web *u.* When the clay to be operated upon is very adhesive, the patentee perforates the pistons *n,* all over with small holes, and covers the surface thereof with flannel, cloth, or other porous material, to prevent the clay from sticking to the bottom of the piston.

In order further to facilitate the delivery of the brick from the mould, a plate, carried by a rod, which is worked by a cam, is made to act against and push forward the brick, so as to detach it from the piston *n,* of the mould, and allow it to drop on to the endless cloth *u.* It will be seen that the surface of the piston is made to project slightly from the edge of

the mould; and, by so doing, every piston, in its turn, is brought under the action of a rotating-brush *v*, whereby it will be cleared of any clay that may have adhered thereto. The pistons *n*, will remain elevated until the moulds come again under the channel *e**, when they will be forced down by the clay being pressed into the moulds as before. The intermittent action of the mould-wheel is effected by means of the pawl or lever, which is jointed to a disc *k*, on the end of the shaft *y*: the joint-pin of the lever is fixed in a block, inserted in a dovetailed groove *w*, made in the disc *k*, and is secured by a screw and nut; it being capable of adjustment therein, to suit the length of stroke desired for working the pawl. The end of this pawl takes into the notches or teeth of the ratchet-wheel *z*, which is secured to the shaft of the mould-wheel *m*. The shaft *y*, is driven by a toothed wheel on the axle of one of the clay rollers *d*, in gear with a similar wheel on the said shaft *y*. By the rotation of the plate *k*, the pawl will be driven forward, and cause the mould-wheel *m*, to rotate so far, as to bring another mould or moulds under the channel *e**, as before described.

The patentee remarks, that he finds it convenient to attach or connect the pawl to the circular plate *k*, by means of a moveable or adjustable block; as, in the event of any hard substance, getting into the moulds from the channel *e**, the block will be forced back in the dovetailed groove *w*, and the machine may be then stopped, and the extraneous substance removed. The speed of the mould-wheel *m*, and, consequently, the number of bricks made in a given time, will depend upon the relative diameters of the toothed wheels, which actuate the shaft *y*, as above described; and as these wheels are merely keyed on their respective shafts, it will be seen that the speed of the mould-wheel can be changed, when required, by merely altering the relative diameters of the two wheels on the shafts of the clay-roller *d*, and the shaft *y*. The bricks, when moulded, are forced out of the moulds by the levers *t*, *t*; these levers are connected by a rod z^1, to an excentric 1, on the shaft *y*. The endless web *u*, on to which the bricks are deposited, is actuated by a system of bevil-gearing 2, 2, which is driven by a toothed wheel on the axle of a ratchet-wheel 4, which is actuated intermittently by a pawl-lever 5, attached to another excentric 6, on the shaft *y*. Fig. 4, is a detached sectional view of part of a mould-wheel, fitted with a number of moulds, for making hollow bricks.

For this purpose, any convenient number of core-pins 7, 7, of any suitable form, are fixed into the bottom of the moulds *l*,

and pass through holes made in the pistons *n, n*: the ends of these core-pins 7, 7, may be made either to come flush with the top of the moulds, as shewn at *l*,—in which event they will form holes entirely through the bricks; or they may be made somewhat shorter, as shewn at *l**, when the bricks will appear solid on one side. It will be evident that, if a mould-wheel, with two or more sets of moulds is employed, each of these sets may be made to produce bricks of different characters, or articles of different kinds or shapes; and they may be so arranged that either set may be used, leaving the others inoperative. When the set of moulds is intended to be used singly, the hopper *c**, and channel *e**, must be divided off, so as to conduct the clay only to that set of moulds which is to be employed.

The patentee claims, First,—the combination of a vertical mould-wheel with a feeding apparatus, for supplying the moulds with clay. Secondly,—the adaptation to the mould-wheel of the pressing-roller *r*, for the purpose of compressing or consolidating the bricks made in the moulds. He also claims the use of the curved plate *q*, and likewise the use of the grooved mixing or pugging-rollers *e, e*, in whatever position they may be placed in the machine. Thirdly,—the method, above shewn and described, of making hollow bricks. Fourthly,—actuating the mould-wheel, by means of a pawl-lever, or any equivalent contrivance, attached to the plate *k*, by jointing it to a block, which may be secured, in any convenient manner, at any point along the dovetailed groove of the plate *k*, so as to admit of the said block being forced back in the groove, when any undue strain is put upon the machine. He also claims actuating the shaft *y*, by means of toothed wheels or gearing, connected with the shaft of one of the clay or pugging-rollers; so that, by merely changing the said toothed wheels, so as to alter their relative diameters, the speed of the mould-wheel *m*, and, consequently, the amount and quality of the work performed by the machine, may be regulated at pleasure. Fifthly,—the method above shewn and described, for pushing out or delivering the bricks from the moulds; also the use of perforated pistons covered with some porous material, for the purpose of preventing the brick from sticking or adhering to the piston; and likewise the use of the mechanical contrivance above explained, or any mere modification thereof, for detaching the bricks from the pistons after they have been forced out of the moulds.

To Joshua Smith, *of Sheffield, manufacturer, for improvements in table knives.*—[Sealed 1st October, 1852.]

This invention consists in forming table knives with a socket in lieu of a tang, for the purpose of attaching the blades to their handles. In some cases a tang and a socket may be employed together; but this is when the blade has been formed in the usual way with a tang.

In carrying out this invention the patentee affixes a socket to the blade by brazing or otherwise, and, if preferred, a rivet or screw is passed through the socket and the handle to hold the blade and the handle together,—care being taken that the holes through the sockets are made slightly bell-mouthed, in order that the rivet-heads may be within such bell-mouths, and be made flush with the outer surface of the socket.

The patentee claims the manufacture of table knives, with sockets fixed thereto to receive and have fixed therein the handles, as described.

To Robert Adams, *of King William-street, in the City of London, for improvements in ball-cartridges.*—[Sealed 1st October, 1852.]

This invention consists in a new mode of attaching the ball to the cartridge or chamber containing the powder.

In Plate X., fig. 1, is a ball, charging-chamber, and wad complete; fig. 2, is a section of the same; and fig. 3, is a ball, shewn separate, with a tang projecting therefrom. *a*, is the ball, and *b*, its tang, which passes though a wad into the metal chamber *c*, and is there rivetted to secure the parts together. The chamber is preferred to be made of sheet-copper; and, when charged with powder, a disc of thin paper is cemented over the end of the chamber. *d*, is a cover for protecting the end of the cartridge. At the bottom of the cover *d*, a shank is provided, through which a wire may be passed for stringing a number of the covers together to prevent their being lost, and likewise for the convenience of packing. The patentee also employs a plate, perforated with holes to allow the shanks of the covers *d*, to be inserted therein; and, when so placed, he passes a wire through the shanks underneath the perforated plate: the cartridges may then be withdrawn from their covers, leaving the covers on the plate.

The patentee claims fixing a metal chamber, containing powder, to a ball and wad.

To EDWIN PETTITT, *of Kingsland, for improvements in the manufacture of ammoniacal salts and manures.*—[Sealed 1st October, 1852.]

THIS invention relates, firstly, to a new mode of manufacturing ammoniacal salts from certain animal matters; and, secondly, to the manufacturing of manure from animal matters.

In carrying out this invention, the patentee selects such animal matters or soft nitrogenous solids, as fish, or the flesh of marine and other animals; he then places one hundred pounds weight of the animal matter to be treated (taking for example sprats or herrings) in a leaden tank, and adds thereto about five pounds weight of the concentrated sulphuric acid of commerce. This mixture is allowed to stand, interrupted by occasional stirring, until it assumes a homogeneous pasty consistence; and sometimes heat is applied, in order to facilitate the operation. The acid liquid or pickle, formed by the acid and aqueous particles extracted from the fish (after it has been in contact with the animal matter a sufficient length of time, varying with the temperature, the strength of acid, and quality of fish), is drawn off and pressed or washed out of the remaining solid matter. The acid liquid is next evaporated almost to dryness, to extract the sulphate of ammonia therefrom, in the form of crystal; which may then be purified in the usual way. In order to obtain muriate of ammonia, the patentee takes the pasty mixture, produced as aforesaid, or the acid liquid drawn from it, and, after adding lime, he distils the same, by great heat, nearly to dryness,—passing the products of distillation through a solution of muriatic acid, or muriate of iron, contained in earthenware or other vessels, known by the name of Woolf's apparatus. The muriate of ammonia may then be separated, in the usual way, by crystallization.

The second part of the invention relates to the manufacture of manures; in effecting which the patentee proceeds in the same way as in the preparatory part of the last process, by reducing animal matter, such as fish, or the flesh of marine and other animals, to a pasty consistence, by means of sulphuric acid; and, when in that state, submitting the mass to artificial heat. Or he first dries the fish or animal matter, then grinds and afterwards treats with three per cent, or thereabouts, of sulphuric or muriatic acid, to act as an antiseptic. These preparations are then fit to be used as manures. He also mixes the dry or pasty compound, before described, with peat charcoal, superphosphate of lime, ground

coprolites, or any other suitable substances, according to the desired quality of the manure and the soil for which it is intended. The patentee remarks, that some kinds of fish appear to be wholly dissolved by the operation of the acid, and others only partially so, or to the extent of causing the flesh to separate freely from the bones, which may be taken away. All oily fish should have the blubber removed; as it is preferable to use them with as little oil as practicable. For this purpose he first boils or steams the fish, then strains off the liquid obtained, and the solid boiled portions, freed from the larger bones, may be treated as before described. He likewise prefers using fish as fresh as possible, as they lose much of their valuable properties in the course of putrefaction.

The patentee claims, Firstly,—the mode or modes hereinbefore described of manufacturing ammoniacal salts from fish and animal matters. Secondly,—manufacturing manures from fish and marine animals; and, Thirdly,—manufacturing manures from the flesh and soft solid nitrogenous parts of land animals.

To Moses Poole, *of Serle-street, Gent., for improvements in coating metal and other substances with a material not hitherto used for such purposes.*—[Sealed 1st October, 1852.]

This invention relates to the coating of rods, tubes, wire, and such like hollow and solid articles, which require to be coated or cased all over their exterior surfaces, to protect them from rust or corrosion; and also applies to the coating of insulators for electric telegraph purposes, where the electric telegraph wires are suspended, and require to have bell or other hollow-shaped coverings over their points of suspension. And cords or bands of fibrous material, which will bear the heat, may likewise be similarly coated. In carrying out his invention, the patentee winds a thin sheet or fillet of India-rubber, combined with sulphur, round the exterior surface of the article (say a tube, rod, or length of wire), taking care that the edges of the thin sheet may slightly overlap; or the sheet of material may be made so as just to cover the outer surface of the article: in either case, care must be taken that the coating material completely covers the tube, rod, or wire. If the surface of the article is made rough, the compound is found to adhere more closely; and, in coating wires of considerable length, the compound may be applied by forcing it, when in a plastic state, through dies, in the manner now in

use for covering wire with gutta-percha. The compound may, in that case, contain a large proportion of pitch or coal-tar, deprived of water. Where it is to be applied to coating insulating bell or other shaped covers, for telegraphic wires, the material may be applied both inside and out, or only on one side, by pressing thin sheets of the material on to the parts desired to be covered. In coating bands or cords, the same mode of proceeding is adopted as with wire: the compound which the patentee prefers to employ, is composed of two parts of India-rubber, and one of sulphur (except when wire is to be covered). This compound having been applied to the article desired to be coated, is then subjected to a heat sufficient to convert it into a hard substance, of the consistence of whalebone or ivory; and the heat is most advantageously applied when the temperature is gradually raised (say in half an hour) to 230° Fahr., and kept at that heat for one hour and a half, and then gradually raised to about 295° to 305° Fahr., and retained at that heat for about four hours. Where the compound contains much foreign matter, the heat may be raised more quickly; and when operating on electric telegraph insulating wires, from 10 to 20 degrees less heat may be employed, in consequence of the coating of the wire being required to be flexible. In all cases where the articles operated upon are likely to adhere, by coming in contact when being heated, they should be coated with powdered talc or soap-stone, to keep them from adhering. The patentee remarks that, in place of sulphur, other substances, containing sulphur, may be employed; and coloring and other matters may be added, such as gum-lac, gutta-percha, coal-tar, or pitch (deprived of its water), white lead, and oxide of zinc.

The patentee claims, coating the exterior surfaces of rods, tubes, wire, and cords or bands, by enclosing them within the compounded materials herein mentioned, so that the edges of the material overlap. Or the articles are otherwise closed over in all parts of their exterior surfaces with the hard substances above described. He also claims the coating of other hollow articles of metal, such as insulating instruments, with such material as herein described.

To MOSES POOLE, *of Serle-street, Gent., for improvements in covering and sheathing surfaces with a material not hitherto used for such purposes.*—[Sealed 1st October, 1852.]

THIS invention consists in employing sheets or surfaces of hard material obtained by mixing India-rubber with sulphur

and subjecting the same to heat: the compound thus produced is formed into sheets (either alone or combined with fabrics or fibres) suitable for sheathing, covering floors, roofs, vessels, and such like applications. When fabrics or fibres are used, the sheets of compound are spread upon them in the usual way, and it is preferred for many purposes to double several of these coated fabrics together. The India-rubber is combined with sulphur by a kneading or masticating process, as is well understood,—the proportion employed being two parts (by weight) of India-rubber to one of sulphur. Instead of sulphur, matters giving off products of sulphur by heat may be used; and, in addition, gum-lac, pitch or coal tar (deprived of water by heat) and white-lead, oxide of zinc, or other coloring matters may be mixed therewith,—the same being rolled into sheets of the dimensions required. The compound may then be connected to a fabric or fleece which will bear the heat; and this is more especially requisite in cases where sheathing is to be cemented to the surface intended to be sheathed. The sheets are then heated at a temperature rising gradually say to 230° Fahr., in about half an hour, retaining that heat for about one hour and a half, and then gradually increasing to from 295° to 305° Fahr., for the remainder of six hours. When the compound contains a considerable quantity of foreign matter, the heat may be more rapidly increased. In applying the sheets, they may be nailed or fixed by screws, and they will form an excellent covering for roofs, ships' bottoms, or other surfaces. Sheets of this compound may be reduced in thickness, and extended in size (when not combined with fabrics), by pressing them between hard and smooth rollers; the temperature being at about 300° Fahr., when the rolling takes place.

The patentee claims the manufacture of sheets, for covering and sheathing surfaces, from a compound of India-rubber and sulphur, with or without other matters, as herein described.

To George Stuart, *of Glasgow, merchant, for improvements in treating the fleeces or natural coverings of sheep and other animals when on the animals.*—[Sealed 2nd October, 1852.]

This invention consists in using a new compound for the protection or improvement of the fleeces of sheep (instead of the old method of using tar and butter) in order to render the wool free from moisture, to add to the warmth and com-

fort of the animal, and likewise to render the wool better for manufacturing purposes. In preparing this compound the patentee uses a resinous matter or substance derived from resin for coating the fibres of the wool before the fleece is shorn from the animal. When the ordinary resin or the rosin of commerce, otherwise termed colophon or colofan, is treated by distillation, a resinous oil, commonly known as rosin oil, is obtained from the treated substance. With this rosin oil the patentee mixes a quantity of solid rosin,—the proportions of the component parts being varied according to the consistency required. He then heats the ingredients to effect a proper combination, and applies the compound to the fleece so that the fibres may become uniformly coated. In conclusion, the patentee remarks that he can use either rosin alone or rosin oil, to effect the same object. He claims, Firstly,—the system or mode of treating the fleeces of sheep and the coats or fibrous coverings of other animals as hereinbefore described. Secondly,—the application and use of rosin or resinous matters or matters derivable therefrom in the treatment of the natural fibrous covering of animals.

To Benjamin Mitchell, *of Romsey, in the county of Hants, builder, for improvements in the construction of artificial legs.*—[Sealed 5th October, 1852.]

This invention relates to a novel construction of artificial leg,—the principal object being, by means of the movement of the thigh, whether in walking, or when sitting down, or rising from a seat, to communicate a motion to the knee-joint, analogous to that of the bending of the natural knee.

The manner of carrying out this invention is shewn in Plate IX., wherein fig. 1, is a partial elevation of the improved construction of limb forming the subject of the present invention; and fig. 2, is a vertical section of the same. *a, a,* is the lower part of the limb, and *b, b**, are the two curved plates, connected at *c*, to each other, and to the part *a*. These plates *b, b**, are each provided with a rest *d*; over which is placed a cushion to receive the stump of the amputated member, and the plates are bound tightly to the stump by means of a strap *e*. The front part of the curved plate *b**, is made hollow to receive a strap *f*, which passes down from the belt round the body of the wearer of the artificial limb, through this hollow channel, and is attached to the lower part *a*, of the limb near the upper part of the calf. The lower end of

the plate *b**, is shaped to fit the part *a*, and to work therein like a ball-and-socket attachment; and thus the appearance of the natural knee, whether the limb be bent or straightened, is attained. Near the point where the strap *f*, is attached to the part *a*, a second strap *g*, is also secured. This strap passes upwards (on the opposite side of the joint *c*, to that of the strap *f*,) through a slot cut in the back of the plate *b*, and thence to the belt before mentioned. When, therefore, the party wearing the limb commences the movement necessary to seat himself, that is, to bring the thigh to a horizontal line, the strap *g*, will be drawn to tension, and thereby the point 1, of the part *a*, (which is the point of attachment of the straps) will be caused to approach the point 2, of the part *b*, (which is the bearing point of the strap *g*,) until the upper and lower parts of the limb assume the position, with respect to each other, indicated by the dotted lines of fig. 2,—the strap *f*, being simultaneously slackened by the nearer approach of the forward part of the belt towards the knee, to allow of this action. As soon, however, as the wearer of the limb begins to rise, a corresponding slacking of the strap *g*, and taking up of the slack of the strap *f*, will take place; and thus the limb will be again drawn out of its bent into its straight position. It will thus be understood that, instead of employing internal springs (as in the ordinary construction of artificial limbs) to keep the leg straight, the effect of which is to necessitate the expenditure of some considerable power (to counteract the pressure of the springs) before the knee can be bent to suit the sitting posture, the proper action of the knee is rendered compulsory, and answers to the action of the hip-joint; which action causes the tension of the one strap, while it slackens the other, to allow of that tension being made serviceable for moving the limb.

The patentee claims the construction of artificial legs, and the mode of controlling the action of the limb by the action of the hip-joint, as above explained.

To David Collison, *of Preston, in the county of Lancaster, cloth-looker, for improvements in the construction of shuttle-skewers.*—[Sealed 6th October, 1852.]

This invention is intended to prevent the loss which now takes place from the end of the cop of weft being rendered so far useless, that it cannot always be run off the skewer to the last.

In ordinary shuttles the metal skewer or pin, on which the cop of weft is placed, has a spring attached to it on one side,

for the purpose of holding the cop steady; and as this skewer or pin is passed up the hole of the cop, the spring, not being very elastic, has a tendency to thrust in the bottom of the cop a little; the consequence of which is, that a large cop bottom is left on the skewer or pin after the shuttle has been worked in the loom; and as this piece of weft is usually thrown away as useless, a loss of weft, of course, thereby ensues.

In order to avoid this loss, the ordinary spring, which is used for holding the cop steady, is dispensed with; and a plain skewer, similar in size to the spindle on which a cop has been spun, is employed. This skewer or pin is jointed to the shuttle, as usual, so that it may be turned up at right angles to receive the cop; and it has an opening or slot made throughout nearly its whole length; and in the slot a lever is inserted, which is mounted on a pin or stud, in such a manner that it will bear against the cop bottom, and hold it firmly on the skewer; but when the skewer is pulled up out of the shuttle, to remove the cop bottom, and put on another cop, the lever is made to retire within the groove, and leave the cop bottom free to be slidden off the skewer.

The figure in Plate IX., shews, in longitudinal section, a shuttle thus fitted. *a, a,* is the body of the shuttle; *b, b,* the skewer, which is hinged or jointed thereto in the ordinary manner, and turns on the pin *c.* In the slot of the skewer is the holding lever *d,* which works on a pin *e,* as its fulcrum. A portion of both sides of this lever is serrated or notched; and when the skewer is down in the shuttle, the heel or back of the lever *d,* rests against a pin *f,* which forces the serrated or notched part of the lever out of the slot. A spring *g,* bears against the heel of the skewer, and holds it steady, either in the horizontal or vertical position. When the skewer is drawn up into the vertical position, the front of the holding lever *d,* is brought against the pin *h,* and is thereby forced back, so that the serrated edge is hidden within the slot. It will now be understood that, as the skewer has no side spring, but is made plain and smooth throughout, like the spindle on which the cop was spun, it will offer no resistance to the bottom of the cop; so that when the cop is placed on the skewer, and the latter is put down in the shuttle, the lever in the slot is made to hold the cop firmly on the skewer, and perform the office of the spring in the ordinary shuttle.

The patentee claims the adaptation to the skewers of shuttles, of a lever, which, being jointed to the skewer, is capable of being thrust in or out, for the purpose of holding the weft cop securely on the skewer, or allowing the cop bottom or end to be drawn off with facility, as above described.

To James Yule, *of St. Luke's Terrace, in the City of Gloucester, mechanician, for an improved arrangement of sawing machinery.*—[Sealed 8th October, 1852.]

This invention relates to a novel mode of mounting the saw-blades or cutting tools used for sawing or severing wood, stone, slate, &c.,—the object being, first, to simplify the construction of the machinery employed, and, secondly, to economize the motive power expended in performing the cutting operation. To this end the patentee mounts the cutting tools at one extremity of a frame which vibrates or rocks on a dead centre, and communicates a reciprocating motion to the frame by means of a pair of links jointed to a pair of levers keyed to a shaft, which receives a rocking motion from the crank shaft of a steam or other motive power engine.

In Plate IX., fig. 1, shews, in side elevation, an arrangement of machinery for sawing wood, constructed according to this invention; and fig. 2, is an end elevation of the same. In these figures, *a, a,* is a dead shaft, carried by suitable supports; and upon it a vibrating frame *b,* is loosely mounted. This frame is constructed, by preference, of cast and wrought iron; the two extremities being cast iron, and the intermediate parts or bracings of wrought iron. Between the side pieces of this frame two cross bars *b*, b*,* are secured by bolts and nuts; and in these bars straight slots are made, extending nearly from end to end thereof, to receive the tangs of the saw-blades *c, c, c,* the cutting edges of which blades are formed to correspond to the arc described by the vibrating frame during its vertical movements. These blades *c, c, c,* are capable of being set at any distance apart to suit the work in hand, in the same manner as the blades of the ordinary self-acting sawing machinery. To the lower end of the fore part of the frame *b,* links *d, d,* are jointed, for the purpose of connecting the frame with a pair of levers *e, e,* to which they are attached. These levers are keyed to a shaft *f,* which is mounted in suitable bearings and is capable of rocking therein,—a lever *g,* connected by a rod *h,* to the crank-shaft of the motive power engine, being keyed to the shaft *f,* for that purpose.

It will now be understood that if a baulk of timber be fed up to the saw blades, and kept in contact therewith by any convenient means, the reciprocating motion of the frame obtained by the throw of the crank of the motive power engine will cause the saws to enter the baulk of timber, and cut it lengthwise into pieces of any desired thickness, ac-

cording to the distance at which the saw blades were set apart before starting the machinery.

When applying this invention to the cutting of stone or other like granular substance, the patentee mounts the frame so that it shall move in a horizontal instead of a vertical plane; and in place of serrated blades, he employs blades with a smooth edge, employing, as is common in such cases, sand and water to facilitate the cutting operation. Or, in place of these smooth-edged blades, he affixes to the cross bars of the frame lines of chisels which will chip off, instead of grinding away, the stone which lies in a line with the progress of these cutting tools.

The patentee claims the mounting of saw-blades or cutting tools on a vibrating or rocking frame, for the purpose of sawing or severing wood, stone, and other materials requiring such treatment.

Scientific Notices.

REVIEW OF NEW WORKS.

The New Patent Law: its History, Object, and Provisions,—by THOS. WEBSTER, Esq., M.A., Barrister-at-Law.

The Law of Patents for Inventions familiarly explained, for the use of Inventors and Patentees,—by WM. CARPMAEL, Esq.

Practical Remarks on the present state of the Law of Patents,—by WM. SPENCE, Assoc. Inst. C.E.

A Summary of the Law of Patents,—by CHRISTOPHER WORDSWORTH, Esq., Barrister-at-Law.

A Treatise on the Law and Practice relating to Letters Patent for Inventions,—by JOHN PAXTON NORMAN, Esq., M.A., Barrister-at-Law.

A Bill, intituled, "An Act to Repeal certain Provisions of the Patent Law Amendment Act, 1852."—(Presented by the LORD CHANCELLOR.)

IF the list which heads this paper is an index of the feeling that exists for the well-being of inventors and patentees, we may safely pronounce their interests to be in good keeping; for it is seldom that a law, which still awaits the finishing touches of the legislature, has had so goodly a number of commentators, who are desirous of smoothing the path for the unlearned,

even at the risk of being tripped up, in their wearisome task, by some still newer Act than that they have taken as their text, and so involving themselves in a useless labor. But if ever there was a time when activity was pushed to the utmost verge of prudence, it is the present; and as the fever is general, we must not be surprised, meet it where we may. From these remarks it will be inferred that we judge the publication of the works before us as somewhat premature. Such is, indeed, our opinion; for in some points they are already, and in many more we trust they will soon be, out of date. Let us not, however, appear to be ungrateful to our authors; for no thoughtful man can write without either adding something to the stock of public knowledge, or making that knowledge the more available to mankind: in each work we have proof of this fact. The first in precedence, in point of date, is Mr. Webster's brochure, which bears the evidence of haste, and seems intended rather as a pilot to a work of more pretensions —such as a new edition of his "Law and Practice," which has long been promised—than as a digest of the law under its new phase. He here presents us with a historical sketch of the attempts, and failures, and ultimate partial success, attendant on the labors of patent law reformers, and lifts the veil just enough to shew us that this country is blest with other legislators than those who make up the two great deliberative assemblies. Mr. Webster's remarks on the objects and provisions of the new law, are conceived in hostility to the old system of procedure in obtaining patents; and he is thereby led to give an undue value to some points of novelty in the present practice,—such, for example, as delaying the period for opposition, instead of, as formerly, taking the opposition at the first stage of the patent's progress; which alteration, to say the least of it, is a source of extreme inconvenience to patentees. At the same time, he deals very freely with the so-called amendments which the Bill received while passing through the Committee of the House of Commons, and leaves it to be inferred that, although a great step has been taken in the right direction, we have not yet attained to perfection in this branch of legislation. His remarks on those clauses referring to the amendment of legal proceedings, are well worthy of attention, and lead us to regret that he has not entered more fully into this branch of the subject, which is his peculiar province. In speaking of clause 42, he says:— "But the most important provision for the protection of property, under letters patent, is the power, now conferred on the courts and judges of common law, of granting injunctions,

and an account, in cases of infringement, in the same manner as heretofore was done by the judges in equity only. None but those who have had actual experience of the delay, inactivity, and expense, attending the old system, can adequately appreciate the importance of this change." This is, indeed, but too true: had the change come earlier, it might have saved many from ruin, and stopped the tide of success of some daring infringers.

In Mr. Spence's little work, which takes the modest form of a stitched pamphlet, the old and the new law are contrasted; their essential points of difference being brought out by the equivalent provisions being set side by side in a columnar arrangement. By this means, a glance will suffice to shew the experienced patentee the nature of the system under which he is now to seek protection. He is also informed of the cost and mode of proceeding; but, at the same time, he is covertly advised, that in patent matters, as in most others, a division of labor is desirable, and that the patentee will wisely limit his portion of the labor to inventing.

The works of Mr. Carpmael, Mr. Wordsworth, and Mr. Norman, have more pretension to library books than those already referred to. Each is well provided with reference notes to the leading decisions which form the groundwork of our patent law; indeed, the pages of Mr. Wordsworth and Mr. Norman really bristle with these—alas! for our degenerate days!—no longer trusted evidences of erudition; not a statement being advanced without the citation of an authority to maintain it. Useful as this habit is in training the mind of a writer to precision, we cannot but look upon its prevalence, in all modern law books, as an evidence either of the unsoundness of the laws themselves, or the practices engrafted thereon, or the defective constitution of the minds of the practitioners, as a class, who unable, by inferential reasoning, to eliminate principles for their own guidance, must content themselves by grasping at, and hanging tenaciously to, facts. Although we are disposed to accept the latter as the true solution, we must at the same time admit, that among the great body of our lawyers there are striking exceptions to this sweeping censure; our experience, however, leads us to the belief—and the almost invariable practice of those who have turned their attention to this branch of literature confirms us therein—that facts, and facts only, are the sum and substance of the general practitioner's creed. The institution of a new law drives him, as it were, out to sea; where he beats about, in most unhappy case, until, in

time, practice elicits a few facts; and thereby he is enabled to feel his feet again, and labor on in his old humdrum fashion. Such, then, being the class to whom modern law books are addressed, we need not wonder that writers care not to dwell upon the reasons on which the dicta they set forth are based, but that they should, in general, sedulously adhere to the recital of facts, and leave principles untouched. A departure, however, from this practice, is nevertheless to be commended, and as such, we are glad to notice a chapter in Mr. Carpmael's work "on the new application of known principles to mechanical and manufacturing purposes," which sets out clearly the reason why patent protection should be withheld from the discoverer of an abstract principle, and why it should be granted for the successful embodyment or application of the principle. It is not because this chapter (clearly as the subject is treated,) contains any new matter, or that any reasons are set forth that would not occur to any well-trained mind, when directed to the subject, that we commend it, so much as that it is a judicious departure from the beaten track. In writing for laymen, this is certainly the only way to write intelligibly; and it would be well if not merely one or two points of patent law (which, to the uninitiated, seem often quite inexplicable) were thus explained, but if the whole code, built up, as it is, almost wholly of precedents, were elucidated by a reference to the principles of justice, or supposed expediency, embodied therein. By a treatise of this nature, the reasoning faculties, as well as the memory, would be brought into active exercise, and thus an interest would be excited which the mere details of facts could never awaken. We have long seen the desirableness of such a work, but we have hitherto looked in vain for a philosophical treatise on patent law. To return to our authors.—Mr. Carpmael, in writing for inventors, touches only on those points which more immediately concern them; and, in a concluding chapter, he attempts to shew them the folly of their complaints at the present mode of adjudicating on patent rights. That a radical change in the system will ere long be demanded, we are well assured; but not less certain are we, that, to be successful, the reform must be inaugurated by patentees themselves.

In Mr. Wordsworth's "Summary of the Law of Patents," the whole subject is brought under review in a concise—we had almost said, too concise—a manner; and, in Mr. Norman's "Treatise," we find a clear and very satisfactory *résumé* of all the points of practice deducible from the leading decisions of the courts, together with a statement of the modifications in-

troduced by the new law. There nevertheless remains to be written an exhaustive examination of the new law; setting out the bearings of the various sections, some of which would not a little startle inventors if they were revealed in their true colors. It is, however, to be hoped, that the present session of parliament will not pass without the amendment of that law, as well as the practice which has sprung up under its shadow. The Bill now before parliament is, we trust, an earnest that steps will be taken to remedy all the defects of the Act of last year. Its purport is simply to enable the Commissioners to issue office-copies of the specifications; to remove that anomaly which now exists, of *two* original drawings (which may, and most likely do, differ, if not in essential, at least in minor, points,) being recorded in the same office; and to prevent the necessity for transcripts of the patents, as they are granted, being enrolled in Edinburgh and Dublin. These provisions are certainly of no great moment, but they would seem to indicate a desire on the part of the government to render the law more complete; and as such, we look upon the introduction of the Bill as a favorable sign for the inventive interest.

INSTITUTION OF CIVIL ENGINEERS.

April 5th, 1853.

The paper read was "*On locomotive boilers,*" by Mr. J. SEWELL.

After shewing the theoretic and practical evaporative value of coal and coke, at different pressures, and the various results under stationery boilers and in locomotive boilers, and with slow or quick combustion, a series of tabulated results was given, shewing that, estimated by the value of the fuel, the best locomotive boiler exceeded the Cornish boiler by about 2 per cent. in evaporative economy; but ordinary locomotive boilers were from 4 to 10 per cent. below the Cornish standard of 10¼ lbs. of water, evaporated by 1 lb. of Welch coal.

Evaporative economy was shewn to follow the increase of the tubular ratio of the heating surface of the long-tubed boilers; but it was urged, that, in practice, evaporative rapidity was as essential as economy of fuel alone; and the Great Western boilers were referred to as efficient examples in this respect.

The rate of combustion, the time of the heat remaining in the boiler, and the number of draughts of steam from the boiler, were shewn to be 25 per cent. in favor of boilers mounted on wheels of 8 feet diameter, over those on wheels of 6 feet diameter,

for ecomomy of fuel and for pure steam to the cylinders. Evaporation, apparently good, not unfrequently proved indifferent, on account of priming, as a diminished duty frequently demonstrated.

The influence of load and velocity on the consumption of fuel, was referred to, as defeating any economical comparison between engines maintaining a speed of 50 miles per hour, and those which only reached a speed of 30 miles per hour.

The recent experiments on the London and North Western Railway, were referred to, as shewing, that the present form of locomotive boilers might be departed from, without evaporative loss, to gain the constructive facilities of a low boiler with high wheels and inside cylinders; and the new shortened boiler was stated to have realized the full average evaporative economy of locomotive boilers, or from $7\frac{1}{2}$ lbs. to $8\frac{1}{2}$ lbs. of water by 1 lb. of coke.

The advantages of a larger proportion of water-evaporating surface to the total water in the boiler, the shorter ascent of steam from the lower tubes to that surface, and the greater proportion of the heat, passing through tubes, nearer the evaporating surface, were referred to, as being in favor of small boilers, with the fewest rows of tubes, generating most steam per square foot of the total heating surface. It was suggested, that vertical rows of tubes, with free vertical steam passages between them, and the largest practicable water surface, so much valued for stationary boilers, might merit a trial in the large locomotive boilers, and might place them on a level with the smaller boilers, in evaporative rapidity per square foot of heating surface.

The want of a more homogeneous structure for locomotive boilers was referred to, in order safely to resist the expansion and contraction which now fell on particular parts only, and ultimately injured the cohesion of the metal at those parts.

Explosions of boilers were noticed, as frequently occurring, when either the safety-valve or the regulator were opened; and it was suggested, that this might be due to the sudden disturbance of the pressure of the elastic force tending to one point, and momentarily increasing the pressure at that point, from the effect of which the boiler might burst, even with the safety-valve in good order. The apparent effects, after explosion, would not be then due to the pressure only, but to the sudden release of the whole elastic force, which, like any other spring, would exert a force beyond its quiescent limit.

The rare occurrence of goods or slow trains leaving the rails without known cause, was proof that Mr. George Stephenson adopted a flange sufficiently deep for the speed of 15 miles, or 20 miles per hour, originally contemplated on the Liverpool and Manchester Railway; but the frequent running off the rails of fast trains, suggested the trial of deeper flanges on the wheels; and it was hoped they would have the effect of adding to public safety and to railway economy.

The discussion of Mr. D. K. CLARK's paper, "*On the principles of locomotive boilers,*" being resumed,—

It was contended, that the same kind of economy which had been introduced into the making of iron, by the use of the developed carbonic oxide, might be adapted to the locomotive boiler, in which, it was asserted, there was now a loss, by the chimney, of nearly 20 per cent. of the fuel. It was not to be supposed, that the proportions of the new boiler were perfect, or that the results, already obtained, were as good as could be expected; on the contrary, further experience only demonstrated the advantages to be expected, from a more careful investigation of the question, and therefore the proposed trial of the new boiler and engine, against any one or two other engines, under the circumstances proposed at the last meeting, was strenuously insisted upon. The mere evaporation of water was considered to be a fallacious test; and the fact of the experiments in the "Heron" being commenced with the water in the tender at a high temperature, might be said to have vitiated the truth of the result, as the difference of bulk, due to the temperature of the water, had not been taken into consideration. It was admitted, that the pressures in the boilers of the two engines, in the trial against the new engine, had not been noticed; but it was presumed they worked up to as high a pressure as they would bear.

In answer, it was reiterated, that to enable a correct opinion to be formed, all the circumstances of the experiments should have been given; that the tabular statements had been analyzed, and been shewn to be deficient in accuracy; and that it was not enough to suppose the two engines to have 'done their best,' as the absolute pressure should have been given, to enable correct comparisons to be made.

With respect to the chemistry of the question, there was no doubt that the carbonic oxide,—the normal product of combustion,—did seize an equivalent of carbon, from the incandescent coal or coke, and took it away, as carbonic acid, in which form no available heat was developed: if this carbonic oxide could be advantageously used, it would doubtless be productive of economy of fuel. But the practical question rested on other grounds. There was still a wide difference between the theoretical calculations of chemists and the practical results arrived at by engineers. Thus, one pound of coal was supposed, theoretically, to be capable of raising ten or twelve millions of pounds of water one foot in height; whereas, the results of the best Cornish engines, shewed the practical effect to be only about one million pounds. Again, by theory, one pound of coal should evaporate nearly 14 lbs. of water, whilst, practically, under favorable circumstances, only about 11 lbs. were evaporated. Whilst this discrepancy between theory and practice existed, it was useless to examine the question otherwise than practically, and therefore the proposed trial should be made.

The importance of the analysis of the gases in the smoke-box

was strongly urged, as a means of ascertaining whether the waste of carbonic oxide was most affected by slow or by rapid combustion, or with long or short tubes: there was reason to apprehend, that with a thick fire, the carbonic acid, passing through the fuel, conveyed away, wastefully, a large portion of the otherwise useful carbon.

It was argued, that the proof of the practically complete combustion of coke in the fire-box, founded on the observed evaporative performance of the fuel, and the heat-properties of the gases of combustion, was as valid, and certain, as any that could be derived from a chemical analysis of the gases.

It was contended, that the expansion of the water in the tender, by heat, was practically insignificant, being only one-half per cent. at 90°, of the volume at 60°, and just one per cent. at 120°, and that, therefore, the measurement by volume, of the water in the tender, was substantially correct, at all ordinary temperatures. Also, that the mean level of the water, notwithstanding fluctua-a tions, might be closely approximated to, and that the average of great number of such observations must be substantially correct.

It was further shewn, that the assumption of a central inert core of hot gas, in the larger tubes, was totally erroneous; but that in reality, the smoke curled along the inside of the tubes, making the hot particles impinge on the upper surface in continuous succession.

Though the applicability of the formula to marine and stationary boilers had not been claimed, yet it did apply, with remarkable exactness, to the results of the performance of marine boilers; and it might be assumed, that some modification of the co-efficient was all that was likely to be wanted for the proper adjustment of the formula to other kinds of boilers.

It was particularly explained, that in the construction of the formula, one proportion of surface to grate was not insisted on more than another;—that a heavier boiler might work as economically as a lighter, and that the lighter boiler was only superior, in so far as it was desirable to combine compactness, lightness, and power, in locomotive engines.

In order to correct errors, in the comprehension and application of the formula, it was deemed necessary to state, that the formula might be constructed in two ways: first, to express the economical evaporative power (c') in cubic feet of water, per foot of grate per hour; and second, to express the total economical evaporative power (c) in cubic feet of water per hour; h and g, respectively, being the total inside heating surface, and the area of grate, both in square feet.

The two constructions would then stand thus—

$$c' = \cdot 00222 \left(\frac{h^2}{g}\right) \quad \ldots \quad (1)$$

$$c = \cdot 00222 \frac{h^2}{g} \quad \ldots \quad (2)$$

It was contended, that if, as was asserted, 20 per cent. of the coke in the fire-box was passed off as carbonic oxide, the evaporation, with ordinary boilers, could not exceed 7·2 lbs. of water per pound of coke; and that in the new Express boiler, where the temperature in the smoke-box was found to be 1100° to 1200° Fahr., the evaporation could not exceed 5 lbs. of water, per pound of coke, which was said to be at variance with the best ascertained facts.

Throughout the discussion, the principal attack had been upon the formula and the reasoning in the paper; but it was contended, that not one of the whole mass of submitted facts, nor the deductions from them, had been fairly impugned. The qualities of the engine had been constantly mixed up with those of the boiler; whereas the paper treated of boilers, exclusively; and it was insisted, that the boiler and engine should be carefully distinguished, that the peculiar necessities and qualifications of each, for efficiency, should be determined; and that then, the respective conditions for the efficient action of those elements, should be so adjusted as to produce the best joint result. Unless such a progressive course of investigation was followed, it was considered impossible to arrive at a final satisfactory conclusion.

April 12th, 1853.

The paper read was "*On the concussion of pump valves,*" by Mr. W. G. Armstrong, Assoc. Inst. C.E.

In the construction of force pumps, acting under heavy pressure, for working hydraulic cranes and other machines, great difficulties were experienced from the beat or concussion, which was generally attributed to the fall of the valve upon its seat; so that when the pump worked fast, or the pressure was materially augmented, serious casualties frequently occurred. At length the author, finding that increasing the passage for the escape of the water from the annular valves—limiting the rise and applying a spring to ensure their rapid closing—would not cure the evil, became convinced that it originated in other sources.

Attention was then directed to the suction valve, as the concussion generally occurred at the instant of the beginning of the return stroke. The numerous anomalous results which appeared to envelop the cause in mystery were carefully investigated, and observation of several ingeniously-devised experiments induced the conviction, that the cause of the blow would be found to be connected with the rise of the delivery valve, which occurred simultaneously with the closing of the suction valve.

On examining the construction of the delivery valve, it was evident, that while its entire upper area was acted upon by the downward or closing pressure, only that portion of the under surface which covered the annular opening, was acted upon by the upward or opening pressure. It was obvious, therefore, that

since the area acted upon from below, was much less than that acted upon from above, a momentary excess of pressure must be produced by the plunger in the pump barrel, in order to raise the valve from its seat. The material of the pump barrel would thus, for an instant, be unduly distended, and a sudden collapse would take place, immediately on the starting of the valve. In the case of a valve which was exhibited, the surface acted upon from below was only one-sixth of the surface subjected to downward pressure; so that the pressure per square inch, exerted by the plunger, in starting the valve, would be six times that of the column to be lifted.

All the effects observed, agreed with this explanation, and, by way of experiment, a valve was constructed with the annular openings so extended, as to diminish the bearing surfaces, and to lessen the difference between the areas of the upper and under surfaces. This construction proved, to some extent, successful, and it was perceived, that a valve of a more ordinary kind would be less liable to concussion than one of the annular form; which latter was abandoned, — a single beat-valve being adopted, in which the bearing surfaces were reduced as much as possible, so as to render the differences of area inconsiderable. The result of this radical change was, that a smooth and nearly noiseless action was obtained, even when the pump made one hundred strokes per minute.

It appeared then, that in all cases, where the pumps were to be worked rapidly, under a heavy pressure, it was important that the delivery-valve should be so constructed, as to yield with facility to the pressure of the plunger or piston; and to attain this object, the area of the valve, acted upon from beneath, must bear a large proportion to the area pressed upon from above.

It was admitted, that in many cases, the concussion did arise from the form of the valve, and that the violence of the shock was attributable to the valve remaining open until after the turn of the stroke, and then being suddenly forced down by the weight of the returning column.

It was suggested that the causes of this action were the excessive rise of the valve, and the overrunning of the column in the rising or delivery pipe, consequent on the momentum imparted to it by the previous stroke of the pump.

The most efficacious remedies were found to be, large dimensions, so as to permit of a free passage for the water, and a very limited rise of the valve; and either increasing the diameter of the delivery pipe, or applying means of keeping up a continuous motion of the column, without drawing tail water through the valves.

It was hoped, that the observations would tend to the removal of an evil, which at present imposed a limit to the speed at which pumps could be generally worked, and which involved the necessity for the use of larger machinery than would otherwise be requisite.

In the discussion which ensued, a modification of the annular valve was shewn, in which the rings were arranged in an amphitheatral form; the outside larger rings being placed higher than the inside smaller rings, so as to give great facility for obtaining a long steady guide in the centre. This form was adopted by Mr. C. Cowper in several large engines.

It was shewn, that concussions were frequently caused by the return of the piston, through a space, upon a body of quiescent water, without any action of the valves. The form of the apertures for the passage of the water might, it was suggested, have some influence in producing the shock, by the velocity imparted to the column.

It was explained, that the aperture in the valve was so much larger than the area of the inlet pipe, that its form could not have much influence.

In proof of the effect of the overshooting of a column of water, it was shewn, that even when water was allowed to rush violently forward, without any considerable pressure of head, a vacuum appeared to be formed and the pipes had been burst.

It was stated, that although the use of vulcanized India-rubber had not been found to diminish the shock of the beat of valves, under heavy pressure, it had been successfully applied to the air-pump buckets of marine steam engines, and an instance was given of a set of valves of vulcanized India-rubber, 38 inches diameter, working 36 strokes per minute, upon a metal grating, the bars of which were $\frac{1}{8}$ of an inch wide and the apertures $\frac{5}{8}$ of an inch square,—lasting in perfect order for upwards of twelve months.

It was stated, that vulcanized India-rubber would bear, perfectly, almost any amount of compression, for an indefinite period, but that on being subjected to repeated extension for a lengthened period, its elasticity became impaired; this, it was suggested, might arise partly from a portion of the sulphur, which was only held in mechanical combination, being thrown off, and also from the substance absorbing heat in contraction and giving it out on distension, and thus producing 'eremacausis,' which eventually caused its disintegration.

It was shewn, that oil rendered tubes of the material fragile; and that the continued action of light and air, upon any India-rubber fabric, sufficed to produce a change and render it brittle.

It was shewn also, that although gutta-percha tubes, whilst under water, were very durable, yet that on exposure to the air for a few years, unpainted, the substance laminated, and could be rubbed to pieces. The gutta-percha covering of the wires of the Submarine Telegraph, was very durable under the sea, but on the face of the Dover cliff, it had soon been destroyed; it was then buried under ground, and had proved perfectly successful.

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April 19th 1853.

The paper read was, "*A description of the Liverpool Corporation Waterworks*," by Mr. T. DUNCAN, Assoc. Inst. C.E.

After some introductory remarks, on the extraordinary rapidity of the growth and extension of the town of Liverpool, and the consequent necessity for a better supply of water, the various ordinary sources of supply for towns were examined; and it was shewn how, by degrees, the private wells required to be so deepened, that the expense became a burthen on the inhabitants; and companies were formed for the general and more comprehensive supply of water, at a cheaper rate, for domestic and public service. Allusion was made to the extensive works, now in course of construction, under the direction of Mr. Hawksley, for bringing, by gravitation, from Rivington Pike, a distance of twenty-four miles, such a supply of water as to supersede the employment of steam-engines, for pumping from the wells in the sandstone, whence the water, used in Liverpool, was almost entirely derived.

From a physical and geological description of the site of the town, its extent, on the right bank of the Mersey, was shewn to be about four miles and a quarter in length, by a width varying from two hundred yards to two miles: the ground rises gradually from the river to an altitude of 250 feet, and the stratum is the lower new red sandstone, covered by a strong tenacious clay, sometimes as much as 26 feet in thickness. The rock dips from the river, at an inclination of one in six, and was full of water throughout its area, which was calculated to be about one hundred square miles.

From a sketch of the history of the several water companies, it appeared that, about the year 1694, permission was granted by the Corporation to a Company, to supply Liverpool with water, from the springs at Bootle; this grant was transferred to Sir Cleave Moore, Bart., in 1709; subsequently, a speculator commenced the construction of a culvert in masonry, but it was abandoned, and nothing further was done until the year 1799, when the "Bootle Waterworks Company," with Mr. Telford as their engineer, and the "Liverpool and Harrington Waterworks Company," with Mr. Thomas Simpson as their engineer, combined together for the general supply of the town.

Descriptions were then given of the first establishment and gradual increase of the Bootle works, from one inconsiderable reservoir, and a steam-engine of 2 horse-power, forcing water through wooden tubes; and the more rapid progress of the Harrington Company, up to the present time, when the Bootle works consisted of a very extensive excavation in the rock, seventeen bore-holes, from 13 feet to 600 feet deep, delivering daily about 1,102,000 gallons; and three engines forcing this water into iron pipes. The duty performed by these engines varied between fifteen millions and twenty-one and a half million pounds, raised

one foot high by one cwt. of coal. The Harrington works consisted of five stations, each with a steam-engine pumping from a well, with lateral tunnels, and bore-holes, yielding various quantities of water, from 124,000 gallons to 819,000 gallons daily; and the engines doing a duty from sixteen millions to forty-seven million pounds of water, raised one foot high by one cwt. of coal. There were four reservoirs, chiefly roofed over, containing, in the aggregate, 1,871,176 gallons, at heights varying from 124 feet to 236 feet above the dock cill.

In the year 1840 a series of conflagrations commenced, causing such a destruction of property, and exhibiting so clearly the deficiency of the water supply, to meet contingencies of that nature, that a scheme was proposed by Mr. Capes Ashlin, the Treasurer to the Highway Board, for an independent supply of water for extinguishing fires, flushing sewers, and other services. The Green Lane works, under the direction of Mr. James Simpson, resulted from this proposal: they were commenced in 1841, and brought into operation in 1847. The supply of water was obtained from a well 185 feet deep, the bottom being 41 feet below the dock cill; extensive tunnels were driven in various directions, whence the water flowed,—the maximum yield being about 850 gallons per minute. The cost of this well was £6,600. The water was raised by a steam-engine, working drawing and plunger pumps, to lift over a stand-pipe 111 feet in height;—the duty being about 49,831,672 lbs.

In connection with this engine was a reservoir, storing 8,000,000 gallons, at an elevation of 223 feet above the dock cill. The growth of "confervæ," in the open reservoir, was found to be so rapid, and so detrimental to the purity of the water, that works were in execution for covering this reservoir, and similar constructions were in progress for extending the storage to 21,000,000 gallons, protected from the light. From all the works which had been mentioned, cast-iron mains, varying in diameter from 18 inches downwards, branched into the streets; in one case being protected in a tunnel,—the lower part forming a duct for the overflow, and for the water for flushing the boundary sewer, as well as for conveying away the contents of the reservoirs when they were emptied.

The Highway Board being restricted to the expenditure of a sum inadequate to the completion of the entire scheme, the chief works were confined to the neighbourhood of the docks, where the most inflammable merchandise was stored, and where fires most frequently occurred. A main of pipes was carried along, and branches laid, with fire-plugs, in clusters (generally of three), at convenient spots, each controlled by a separate valve. The general system of fire-service (which was described) appeared to be very perfect, for, in a tabular statement, it was shewn, that in 1842 there occurred 140 fires, in which property was destroyed to the amount of £517,927,—and gradually decreasing until in

1852, in 132 fires, the value of property destroyed only amounted to £15,880.

The hydrants for watering the streets, and which served also for fire-plugs, were formerly of very rude construction: an improved form had been adopted, and the water-carts were each filled in about one minute, so that one cart could distribute about fifty loads per day. Branches were taken off the mains by easy bends, with a valve to each, whence the pipe curved gradually, and entered near the bottom of the sewer, in a line with the current.

In 1846-7, the Corporation obtained a Bill, authorizing the purchase of the existing water works, and for the transfer of the powers of the Highway Board; this was completed under the arbitration of Mr. Robert Stephenson, at the price of £622,000; and, since January, 1848, the combined system has been in force. Previous to the amalgamation of the works, one company pretended to give a daily supply, whilst the other only laid on the water three times in each week. Daily supply was now attempted, and a constant service was projected, when the water from Rivington should arrive in the town;—the fire service would also be extended at that time.

The mains and branches, having been laid by separate companies, were, of course, placed without any regard to regularity, or any view to combination; it had, therefore, been very difficult to arrange any definite system; no correct plans of the old works existed; the pipes had been so broken, patched, and plugged, that the water-way was nearly stopped, and they had, in many cases, sunk so much, that no general level was maintained; great difficulties arose in the attempt to systematize the service, and it became necessary to divide the town into sections, which could be worked separately or conjointly. The diameter of the lead service-pipes was reduced gradually to $\frac{3}{8}$ inch; wooden plugs were forbidden; a better kind of ferrule was employed; the weights of the various pipes were regulated by a scale, and adapted to a contour line; meters had been introduced with great advantage, both to the company and the consumer: an intermittent supply was not, however, considered so favorable to their use as a constant supply. The meters principally used were made by Mr. Parkinson, of London; they were rented of the Corporation by the consumers, and ranged, in capacity, from 200 to 1,200 gallons per hour.

The supply of water for the shipping was a matter of importance, and was now well arranged, by means of hydrants and hose, the latter extending on board the vessels. Formerly much water was wasted, and the goods around were injured; now a cask, containing 120 gallons, could be filled in two minutes without any waste. After trying all sorts of hose, the preference was given to the copper-rivetted leather hose, $2\frac{1}{2}$ inches in diameter.

The extension of the works at Green Lane in 1850, and com-

pleted in 1852, consisted of a steam-engine, working into the original well by the side-shaft: the duty was 57,800,000 lbs. by 1 cwt. of coal. Gutta-percha seatings had been used in the valves, and were found to answer well. A mixture of black-lead and gutta-percha had also been found to succeed for pump buckets. Tabular forms were given, of the cost of pumping the water for the town supply; whence it appeared that the average cost per million gallons was—

	£	*s.*	*d.*
In 1850	4	12	3¼
„ 1851	3	4	9
„ 1852	2	18	2¾

The price of Wigan coals was, at Bootle, 6*s.* 10*d.*, and slack 3*s.* 8*d.* per ton; giving an average of 6*s.* 6*d.* per ton for the mixture; and at the other stations about 6*s.* per ton for the mixture.

Another bore-hole was also put down at Green Lane, which had proved most successful, and yielded 1,115,474 gallons per day in addition to the former produce of the well, without any indication of diminishing the produce of the other wells.

A tabular statement of the rainfall in Liverpool for 1850-51 and 52, gave a depth of fall—

In 1850	21·460	inches
„ 1851	26·280	„
„ 1852	32·202	„

The maximum daily yield of the public wells, situated within an area of eight million superficial yards, was six million gallons, or three-quarters of a gallon per day per superficial yard; or equal to a depth of 4 feet 10 inches per annum over the whole area.

A comparison was then drawn between the intermittent and constant supply systems. After stating that the quantity of water delivered in three years was—

1850	1,582,492,693	gallons
1851	1,644,035,502	„
1852	1,850,783,362	„

it was shewn, that the constant supply, when tried for a short time, had approached so nearly to the entire yield of the wells as to enforce recurrence to the intermittent system until the anticipated larger supply was received.

The paper concluded with an analysis of the water and a statement that when the entire arrangements were completed, a million of inhabitants could be fully supplied at Liverpool with water of the best quality.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

(Continued from page 305.)

A paper, by Mr. J. D. MORRIS STIRLING, was read:—"*On Iron, and some improvement in its manufacture.*"

After a brief introduction, setting forth the importance of a chemical examination of this manufacture, the author proceeded to state that, the chief varieties of iron ore which are used in this country are the 'clay-band,' the 'black-band,' and the 'hematite.' From the hematite the purest pig-iron and strongest bar-iron are said to be made; and from clay-band a stronger malleable iron is generally supposed to be obtained than from the black-band; but the various qualities can be altered by the judicious iron-master; and malleable iron, of as good quality, can be produced from black-band as from the hematite or clay-band.

The first stage in the manufacture of iron is the conversion of the ore into cast-iron, which is accomplished in various ways. In Great Britain, the ore, after being calcined, if necessary, is introduced with layers of coal or coke, and a flux (usually a carbonate of lime), into a large furnace, and a strong blast (either hot or cold) is urged through the previously kindled mass, to accelerate the combustion of the fuel, and the conversion and fusion of the metal, which is usually tapped from the furnace once in twelve hours, and run into pigs or ingots, which go by the name of "hot or cold-blast iron," according to the nature of the blast employed. The subdivisions of both these sorts of iron are the same, viz., Nos. 1, 2, and 3, when for foundry purposes; and forge or white iron when intended for being converted into malleable iron. These numbers and qualities of iron are supposed to differ from each other in the quantity of carbon contained in each, although this is doubted by many éminent chemists. No. 1 is certainly darker, softer, and more carbonaceous-looking than the other numbers; and forge or white iron appears to contain very much less carbon than any iron intended for foundry purposes: but, as we see a similar effect produced on foundry iron by rapid chilling to that produced in forge iron by the supposed abstraction of carbon, it will perhaps be more readily admitted that colour is not a test (or, at least, not a certain one) of the quantity of carbon which iron contains.

It may be here remarked, that the Nos. 1, 2, 3, give no real idea of the nature of the iron; they are relatively comparative, and only indicate the differences between cast-iron of the same district and make; thus, what is called No. 1 in Wales, resembles hard No. 2 in Scotland, and corresponds to Staffordshire No. 2 (average); Welsh No. 2 is fully as hard as Staffordshire No. 3,

or Scotch No. 4 (a brand), intermediate between No. 3 and forge iron. As a general rule, Nos. 1 and 2 are adapted for small castings; Nos. 2 and 3 mixed, for medium castings; and No. 3, or 3 and 4, in Scotland, or 3 in England, for heavy castings; but the mixtures of Welsh and Scotch, or of Staffordshire, Welsh, and Scotch, are found to make stronger and better castings than those made from one sort of iron.

This mode of producing strong castings has been long practised, and is in many places convenient; and the increase of strength is no doubt satisfactory; but there is still a want of uniformity in result, and an occasional difficulty of keeping to the proportions, and even in obtaining the brands specified by the engineer or architect, or chosen by the founder on his own experience.

It seemed to the writer very desirable, therefore, to obtain, if possible, a kind of iron which should be either uniform and constant in its strength, or, at least, not under a certain standard, and, after numerous experiments and trials, he attained this object by making certain mixtures of wrought and cast iron, which have been called "toughened cast-iron."

It should be stated, that No. 1 is considered the weakest, and No. 3 the strongest. To render these uniform in strength, and, at the same time, to equalise that of cast-iron from different districts, it is only necessary to vary the quantity of wrought-iron introduced; by which means all other mixture is avoided, and so much greater strength insured, as to allow a margin for considerable variation in strength, from any accidental defect, as well as for a diminution in weight; taking the averages of the toughened cast-iron, and of the best mixtures.

Transverse strength of bars, 1 *inch square,* 4 *feet* 6 *inches between supports.**

Cast-iron, average breaking weight		436 lbs.
Toughened cast-iron,	ditto	733 „

*Tensile strength.**

Cast-iron, average breaking weight		7·036 tons.
Toughened cast-iron,	ditto	11·790 „

Crushing strength.

Cast-iron, average crushing weight		38·582 tons.
Toughened cast-iron,	ditto	59·522 „

To render the above more intelligible, the proportions are given below, which have been found to bring very soft Scotch (No. 1

* The averages of the transverse and tensile strengths are from the experiments of Mr. Hodgkinson, in the Government Report, and elsewhere, and other experimenters; Mr. Hodgkinson is the sole authority for the resistance of crushing force.

hot-blast), and very hard Welsh (No. 2 cold-blast), to nearly the same strength.

Scotch, No. 1 hot-blast, breaking when unmixed at	430 lbs.
With a mixture of 33 per cent. of wrought-iron scrap, broke at	713 „
The same Scotch iron as the first, with only 20 per cent. of malleable scrap, broke at about	620 „
Shewing a deficiency in the quantity of the scrap.	
Welsh, No. 2 cold-blast, breaking when unmixed at	440 „
With a mixture of 10 per cent. of wrought-iron scrap, broke at	689 „

The results obtained by Mr. Hodgkinson are very favorable, as shewn in the following table, where the breaking weights of common cast-iron and toughened cast-iron are given, from the Report of the Commissioners appointed to inquire into the strength of iron.

Table of Comparative Strength of Cast Iron.

Description of Iron Bars, all two inches square.	Transverse Breaking Load, in Centre.	Tensile Breaking Strength.	Crushing Strength.
	lbs.	Tons per inch.	Tons per inch.
Toughened Cast-Iron, with 20 per cent. wrought scrap	2174	11·50	54·64
Low Moor, No. 1	1207	5·67	27 00
Blaenavon, No. 2	1220	7·46	49·11 30·50
Warrington best Gun Mixture	1375	—	—

Comparative trials on a larger scale, made by Mr. Owen (by command of the Admiralty), give equally satisfactory results. Tensile strength, according to Mr. Owen, is 12·50 tons.

Since these experiments and trials were made, the toughened cast-iron has been successfully used in the construction of several public works, Windsor Bridges, Chelsea Bridge, Yarmouth Bridge, &c., &c.; and, it may be mentioned, that by being allowed to reduce the scantling in proportion to the increased strength gained by employing the toughened cast-iron, the contractors for the heavy castings for the Manchester Viaduct were enabled profitably to fulfil their contract; whereas, had they used common iron, and been confined to the specification, they would have been heavy losers.

For shafting, rolls, pinions, cog-wheels, cast-iron railway-carriage wheels, cylinders, and other castings, where strength and closeness of texture are desirable, the toughened cast-iron will be

found most useful; also, cast-iron which will not chill in its unmixed state, readily chills with less loss of strength than usual, when mixed in proper proportions with malleable iron.

To ensure that the proper proportion of malleable iron is contained in each pig, and also to render the mixture more easily conveyed from place to place, the writer prefers making the mixture at the blast-furnace, and this is done by distributing the proper weight of malleable scrap in the moulds into which the melted iron is to be run. It is thus firmly fixed, and melts more easily and regularly with the cast-iron in the cupola or other furnace; the cast and wrought-iron heating gradually to the melting point of the former, when the wrought-iron is easily acted upon, and fluxed by the cast-iron.

The process of converting cast into malleable iron is much more varied than that of converting the ore into cast-iron. In some districts a great portion of the cast-iron is refined previous to its conversion; in others little refined iron is used; and in some works cast-iron is at once converted into malleable iron: this latter process seems to be gaining ground.

Refining is perhaps the least understood, and the least capable of being explained, of any process connected with the iron-manufacture. The iron is kept in a fluid state in contact with carbonaceous matter exposed to a blast, and although it would seem that by such means more carbon ought to be combined with the iron, experience shews that a great change is produced in the nature of the metal, and that, as far as we know, the quantity of carbon is diminished, and the iron rendered more nearly akin to malleable iron, or at least so altered as to be more quickly converted into it.

Refining is an expensive process, great waste of material being unavoidable, but it is still necessary for certain descriptions of iron, and the expense is partly compensated by the greater quickness with which the conversion takes place in the puddling furnace.

Puddling is the last and most important process in the conversion of cast into malleable iron. It is still an extremely rude one, and its theory is not understood; it consists in melting in a peculiarly-constructed air furnace, refined or cast-iron, or a mixture of them, and as soon as the fusion is complete, in continually stirring the melted metal till spicular or granular particles shew themselves. Previous to this the melted metal swells up, and, as it is technically termed, boils, with the evolution of gas; and this appears to be the period at which conversion commences: the solid particles increase in quantity, and the whole mass acquires a semi-solidity. The workman keeps collecting the more solid portions, and forming them into balls, which become larger and larger, until the whole of the malleable iron is collected, and nothing remains but what is called cinder, in a

perfectly fluid state: this is then removed from the furnace by tapping, and again used in certain proportions along with ore in reproducing cast-iron. On the removal of this cinder from the iron, by puddling, squeezing, and rolling, the quality of the resulting wrought-iron very much depends.

To avoid the process of refining, to shorten the process of puddling, and to improve the quality of the resulting wrought-iron, are undoubtedly most desirable. The writer has endeavoured to accomplish this by the following means:—Instead of using refined iron, a mixture of wrought and cast-iron (as already described) is taken, and after being melted and run into pigs or slabs of the requisite size, it is puddled in the usual way, and the process of puddling is found to be thus so shortened, as to allow of from one to two heats more being brought out in the course of the twelve hours; the yield is greater, and the quality of the iron is much improved as regards fibrousness and tensile strength; thus rendering such iron particularly well adapted for cable iron, tension bars, shaftings, axles, &c., but not for the wearing surfaces of rails, nor for the tires of wheels.

Before proceeding to touch on certain other processes which the writer believed would improve iron for special purposes, he referred to some alloys of cast-iron, the making of which had led him to make the addition of the same and other metals to wrought-iron.

The first is an alloy of iron and tin, which is extremely hard, sonorous, and capable of receiving a very high polish: the addition of manganese, and a very small per-centage of zinc, gives somewhat greater tenacity. Bells made of these alloys have a pure and clear tone. Cast-iron will take up from 20 to 25 per cent. of tin.

Cast-iron alloyed with zinc becomes closer in its texture, and, as far as the writer's experiments have yet gone, stronger, and not less malleable. Alloys of bismuth, antimony, copper, and silver, possess some scientific interest, but it would be out of place to touch on them now.

Having observed the hardening effect which tin produces upon cast-iron, the writer tried a similar mixture in the puddling furnace, and found a corresponding result, with this essential difference,—that whereas cast-iron will take up about a fifth of its weight, wrought-iron is rendered too hard for subsequent working by any quantity exceeding one per cent.: and taking the various descriptions of iron (Staffordshire, Scotch, and Welsh), one-half per cent. of tin produces a description of iron that is crystalline, close in texture, and harder than common wrought-iron.

This quality of iron appeared to be suitable for the wearing surfaces of rails, and tires of wheels, and subsequent trials have fully confirmed this opinion. Lamination is prevented, and the

rail, when properly made, wears smoothly and evenly. In all iron, and particularly in rails, much depends on manufacture; for points and crossings made of this hardened iron, and rails upon sharp inclines, where the wear previously had been very rapid, have been found to last more than double the time of any rails previously tried, and as they are not yet worn out, it is at present impossible to say how much longer they will last. The writer does not believe their increased duration to arise solely from the greater hardness, but more from the peculiar crystalline texture and fine grain of the iron resisting the lamination, which great speeds and heavy engines so rapidly produce.

The addition of zinc, its oxides and other ores, produce the very opposite effect to tin, and the other metals above named. Iron of what is called cold-short quality, is rendered, by this means, fibrous tough and strong; red-short iron is also improved in quality by the same means, but it is found that a larger addition of zinc or its ores or oxides is required to effect an improvement in red-short than in cold-short iron. The quantity necessary to improve cold-short iron varies much in different districts, and each peculiar iron requires to be separately considered; it is also necessary to know the per-centage of zinc in the ore, if ore be employed, and to ascertain that such ore does not contain foreign matters, which might counteract the effect of the zinc. The addition of these metals to the iron is best made when the iron in the puddling furnace is beginning to boil.

The writer was much gratified to observe in the American Department of the Great Exhibition, a confirmation of his experiments on this subject. Iron, naturally cold-short and red-short, being rendered free from each of these qualities by the addition of an ore of zinc,—samples in all stages of progress were exhibited.

Table of Comparative Strength of Wrought Iron.

Description of Iron.	Tensile Breaking Strain.	Deflection with Strain of 9¼ cwt.	Permanent Set, in lengths of 2½ feet.	Final Stretch, in length of 2 feet.
	Tons per in.	Inches.	Inches.	Inches.
Hardened Wrought-Iron, with ⅔rds per cent. Tin ...	22·92	1·42	1·02	¼
Toughened Wrought-Iron	27·81	—	—	—
Dundyvan Best Bar	24·33	2·02	1·60	3½
S. C. Crown average result ...	24·47	—	—	—
Hartley's general average of Bar-Iron	23·33	—	—	—

In concluding his paper the writer said, that had the limits of a mere sketch like this permitted, he would have entered on the consideration of the relative qualities of cold and hot blast iron, and of the effects produced by the use of cinder; also, on some combinations of iron with the earthy bases, and on the effects of various salts and fluxes in the blast and other furnaces. Several other alloys of iron were stated to possess considerable interest, and allusion was made to a remarkable property which iron possesses of closing the grain of other metals and alloys when added thereto in minute quantity.

LIST OF GRANTS OF PROVISIONAL PROTECTION.

[*Cases in which a full Specification has been deposited.*]

898. Moses Robinson, of Brussels, for certain improved means for preventing accidents on railways.—[*Dated April* 14*th.*]

923. Joseph Dunning, of Regent-street, for an improvement in the construction of coke ovens.—[*Dated April* 16*th.*]

929. William Walker Stephens, of Edinburgh, for the application of retorts in gas ovens or other ovens, and of gas ovens or other ovens which are constructed as retorts, to the process of improving iron, and converting iron into steel.—[*Dated April* 18*th.*]

[*Cases in which a Provisional Specification has been deposited.*]

823. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in drying furnaces,—being a communication.—[*Dated November* 23*rd.*]

264. Charles Cattanach, of Aberdeen, for certain apparatus for measuring the human figure, and transferring the said measurement to cloth.—[*Dated January* 31*st.*]

575. Augustino Carosio, of Genoa, for a hydro-dynamic battery, or new or improved electro-magnetic apparatus, which, with its products, are applicable to the production of motive power, of light, and of heat.—[*Dated March* 7*th.*]

584. Samuel Cunliffe Lister, of Bradford, Yorkshire, for improvements in machinery used in washing wool.—[*Dated March* 8*th.*]

625. Nicholas Auguste Eugène Millon and Leopold Mouren, of Algiers, for certain improvements in the treatment of corn and other grains, and more especially in all that concerns washing, drying, grinding, curing, and preserving them.—[*Dated March* 12*th.*]

632. William Quinton, Benjamin Quinton, and John Quinton, of Birmingham, for improvements in the construction and manufacture of measuring rules.

633. Lord Howard de Walden and Seaford, for whitening and cleansing sugar by the application of steam and hot air in a centrifugal sugar machine,—being a communication.
634. William Edwards Staite, of Manchester, for improvements in apparatus for producing and applying current electricity, parts of which apparatus are applicable for obtaining and treating certain chemical products resulting from electrolytic action.
636. Bennett Alfred Burton and Henry Mortimer Burton, of John's-place, Blackfriars-road, for improvements in the mode of manufacturing casks, vats, and other like vessels, and in the machinery or apparatus to be employed for such purpose.
638. John Henry Johnson, of Lincoln's-inn-fields, for improvements in dyeing,—being a communication.
639. John Scott, jun., of Greenock, for improvements in the treatment or manufacture of animal charcoal.
640. William Stevenson, of Johnstone, for improvements in the treatment or manufacture of textile materials.
641. William Bashall, jun., of Preston, Lancashire, for improvements in dressing, sizeing, and tape machines.

The above bear date March 14*th.*

642. William Morgan, of Spencer-street, Shoreditch, for the manufacture of a portable double-action folding-chair.
643. Thornton John Herapath, of Bristol, for improvements in treating sewage, and in manufacturing manure therefrom.
644. Pierre Sigisbert L'Hernault and Jean Richard, of Paris, for an improved means for unhooking horses and impeding or stopping vehicles on common roads.
645. François Durand, of Paris, for an improved kind of loom.
646. Joseph Maudslay, of Lambeth, for improvements in screw propellers for ships and other vessels.
647. Perceval Moses Parsons, of Duke-street, Adelphi, for improvements in working the valves of steam-engines.
648. Ephraim Sabel, of Broad-street-buildings, for improvements in the construction of looking-glasses, and in the apparatus connected therewith,—being a communication.

The above bear date March 15*th.*

649. George Knight, of Birmingham, and John Heritage, of Warwick, for an improvement or improvements in drying bricks and such other articles as are or may be made of clay.
651. Charles Heard Wild, of St. Martin's-lane, for improvements in fishes and fish-joints for connecting the rails of railways.
652. William Malins, of Saville-row, for certain improvements in the application of atmospheric propulsion upon railways.
653. Henry Richardson Fanshawe, of Arthur-steeet, Old Kent-road, for improvements in fire-arms.
654. Samuel Colt, of Spring-gardens, for improved apparatus for heating and annealing metals.

655. John Oliver, of Newcastle-upon-Tyne, for improvements in the manufacture of a red pigment, commonly called Venetian red.
656. Edward Nickels, of the Albany-road, Camberwell, for improvements in preparing lubricating matters,—being a communication.

The above bear date March 16th.

657. John Livesey, of New Lenton, for improvements in pile and looped fabrics, in cutting and finishing such fabrics, and in the machinery employed therein.
658. John Talbot Ashenhurst, of Upper John-street, for improvements in piano-fortes.
659. William Blinkhorn, of Sutton, Lancashire, for certain improvements in the construction of furnaces and annealing kilns employed in the manufacture of glass.
660. George Johnson, of Stockport, for certain improvements in looms for weaving.
661. James Roscow and Robert Bullough, both of Bolton-le-Moors, for certain improvements in machinery or apparatus for raising water and other fluids.
662. John Bottomley, of Bradford, for improvements in the manufacture of figured or ornamented piled or plushed fabrics.

The above bear date March 17th.

663. Richard Peters, of Southwark, for an improved machine for mortising and tenoning, drilling, and boring.
664. James Tweedale, Abraham Alfred Tweedale, and Samuel Tweedale, all of Clegg Hall, Rochdale, for certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.
665. Paul Cameron, of Glasgow, for improvements in marine and surveying compasses.
666. William King Westly, of Leeds, for an improved comb or gill for heckling, drawing, roving, and otherwise preparing to be spun, hemp, flax, tow, silk, wool, and other fibrous substances.
667. John Henry Johnson, of Lincoln's-inn-fields, for improvements in steam-engines,—being a communication.
668. Malcolm Baxter, of Glasgow, for improvements in steam-engines and pressure-regulating valves.
669. Richard Archibald Brooman, of Fleet-street, for an improved machine for weighing or measuring and packing spices, drugs, coffee, and like matters,—being a communication.
670. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in power looms,—being a communication.
671. John Haskett, of Wigmore-street, for improvements in grinding stones and whetstones,—being a communication.
673. Charles Harratt, of Royal Exchange-buildings, for improvements in strengthening the masts of ships and vessels.

674. Robert Oates Christian, of Havre, for certain improvements in bed-hangers for ships carrying emigrant passengers, and in the manner of manufacturing them.
675. Robert Oates Christian, of Havre, for certain improvements in ventilating.
676. Alfred Warn Banks, of Newgate-street, for improvements in the manufacture of life-belts.
677. George Ross, of Hatton-garden, for an improved manufacture of lubricating oil, and a mode or modes of applying such oil to the purposes of lubrication,—being a communication.
678. George Mackay, of Buckingham-street, Strand, for improvements in the manufacture of iron,—being a communication.
679. Robert Bowman Tennent, of Gracechurch-street, for an improvement in the machinery employed for pulping coffee,—being a communication.

The above bear date March 18th.

680. John Eldridge, of Stanley-street, Pimlico, for an invention for washing woollen, linen, cotton, silken, hempen, skin, and flaxen materials and substances, and called "the rotary washing machine."
681. Joseph Haley, of Manchester, for improvements in the method of transmitting communication from one part of a railway train to another.
682. Henry Bousquet, of Fenchurch-street, for improvements in the manufacture of manure.
683. George Dalton, of Himley, near Dudley, for certain improvements in smelting or reducing iron ore, iron stone, or slag, or scoria.
684. John Henry Johnson, of Lincoln's-inn-fields, for improvements in regulating steam-engines and other prime movers,—being a communication.
685. Samuel Radcliffe and Knight William Whitehead, both of Oldham, for certain improvements in machinery or apparatus for grinding or setting the surfaces of cylinders and rollers employed in carding-engines.
686. Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, for an improved construction of oil lamp,—being a communication.

The above bear date March 19th.

687. James Fraser, of Gracechurch-street, for improvements in the manufacture of portable packages.
688. William Whitaker Collins, of Buckingham-street, for certain improvements in looms for weaving,—being a communication.
689. Thomas Sykes, of Castleford, for improvements in the treatment of soapy and greasy waters,—being a communication.
690. Moses Poole, of the Regent's Park, for improvements in generating steam and other vapours,—being a communication.

691. Jean Marie Durnerin, of Paris, for improvements in apparatus for extracting liquid out of solid substances, specially applicable to the treatment of fatty matters.

692. Moses Poole, of the Regent's-park, for improvements in obtaining power where air is employed,—a communication.

693. Isaac Taylor, of Stanford Rivers, for improvements in machinery for printing woven and other fabrics.

694. John Barsham, of Kingston-upon-Thames, for improvements in apparatus for communicating between the guard and engine-driver, or other persons, in a railway train.

695. John Brett, of Camden-town, for an improved portable sketching apparatus for artists.

696. John Stather, of Kingston-upon-Hull, for improvements in printing.

The above bear date March 21st.

697. Edwin Maw, of Seacombe, for an improvement in the mode of connecting sheets of corrugated iron, when used in the construction of roofs, iron houses, and other purposes.

698. Samuel Mc Cormick, of Dublin, for improvements in manufacturing screws, bolts, spikes, and rivets, and other similar articles, and in the machinery or apparatus used for such manufacture; parts of which machinery are applicable for forming screw-threads, mouldings, and ornaments on metal.

699. Thomas Bouch, of Edinburgh, for improvements in signals.

700. John Henry Johnson, of Lincoln's-inn-fields, for improvements in the mode of smelting iron and other ores,—being a communication.

701. William Johnson, of Lincoln's-inn-fields, for improvements in rolling and shaping malleable metals,—a communication.

702. Nicholas G. Norcross, of Lowell, Massachusetts, America, for certain improvements in machinery for planing or reducing boards or timber.

703. Frederick Futvoye, of Regent-street, for an improved apparatus to be employed in games of chance.

704. Henry Henson Henson, of Hampstead, for an improvement or improvements in buffers.

The above bear date March 22nd.

705. James Allen, of Manchester, for certain improvements applicable to the safety-valves of steam-boilers or generators.

706. John Henry Park, of Preston, Lancashire, and Joseph Park, of Preston aforesaid, for improvements in water-closets and urinals.

707. Jean Baptiste Massat, of Paris, for certain improvements in the manufacture of knives and other similar handle instruments.

708. Bernard Boyle, of Raven-row, Mile End, for a centripetal flange.

709. Hesketh Hughes and William Thomas Denham, both of Cottage-place, for improvements in piano-fortes, organs, seraphines, and other like musical instruments.
710. William Mann Crosland, of Beaumont-street, for improvements in block-making machinery.
711. Antoine François Jean Claudet, of Regent-street, for improvements in stereoscopes.

The above bear date March 23rd.

712. Charles William Siemens, of Adelphi-terrace, and Joseph Adamson, of Leeds, for improvements in rotatory fluid meters.
713. John Beaumont, of Dalton, near Huddersfield, for a new manufacture of certain descriptions of woven fabrics.
714. William Prior Sharp, of Manchester, for certain improvements in machinery for spinning and doubling cotton and other fibrous substances.
715. Robert Grundy, of Hindley, Lancashire, and James Jones, of Warrington, for improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.
716. Charles Victor Frederic de Roulet, of Paris, for certain improvements in the manufacture of piled figured fabrics, by alterations in, and additions to, looms for weaving; including also a warping machine, with a method of reading and arranging the colors or materials for the patterns of such figured fabrics.
717. Henry Webster, and Edward Dawson Stones, both of Sheffield, for improvements in the construction of gas-stoves.
718. William Keates, of Liverpool, for improvements in the manufacture of tubes and mandrils,—partly a communication.
719. Charles Augustus Holm, of Cecil-street, Strand, for improvements in propelling vessels.
720. George Isaac Jackson and Henry David Jackson, of Castle-street, Liverpool, for improvements in fasteners for buttons.
721. William Mc Naught, of Rochdale, for certain improvements in steam-engines.
722. William Edie, of Dundee, for improvements in the treatment or manufacture of textile materials.
723. Robert Walker, of Glasgow, for improvements in working and increasing the safety of railways.

The above bear date March 24th.

724. Erasmus Symonds, of Great Bell-alley, London, for an improved self-acting plug for barges, boats, and other vessels.
726. Robert Hazard, of Lincoln's-inn-fields, for a "podombroslontron," or an improved apparatus for either sponge or shower-bath, and all lavatory purposes.
728. Thomas Smedley, of Holywell, for certain improvements in steam-boilers.
730. Richard Archibald Brooman, of Fleet-street, for an improved rag-tearing and separating machine,—being a communication.

731. George Robb, of Glasgow, for improvements in the manufacture of sulphuric acid, alkalis, and their salts.

732. James Worrall, jun., of Salford, for certain improvements in the method of preparing, treating, and finishing cut, piled, or raised fustians, and other similar goods or fabrics, and in the machinery or apparatus connected therewith.

The above bear date March 26th.

733. George Oakes Asbury, of Birmingham, for an improvement or improvements in the manufacture of dowls used in joinery.

734. John George Truscott Campbell, of Lambeth-hill, Upper Thames-street, for certain improvements in ships' propellers.

735. David Stephens Brown, of the Old Kent-road, for certain improvements in engines to be worked by steam, or any other elastic fluid; which invention also includes the apparatus for generating such steam or other elastic fluid.

736. Augustin Chrysostome Bernard, and Jacques Marie Pierre Albéric de St. Roman, of Paris, for an improved mode of giving publicity.

737. Thomas James Perry, of the Lozels, Birmingham, for improvements in printing.

738. John Scott, jun., and George William Jaffrey, both of Greenock, for improvements in steam-engines.

739. Samuel Fox, of Deepcar, near Sheffield, for an improvement in the frames of umbrellas and parasols.

740. George Edward Dering, of Lockleys, for improvements in preserving or preventing decomposition in vegetable and animal substances and matters.

741. George Edward Dering, of Lockleys, Herts, for improvements in the manufacture of certain salts and oxides of metals.

The above bear date March 28th.

742. Samuel Bayliss, of Old Broad-street, for improvements in the construction of ships and vessels.

743. James Webley, of Birmingham, for improvements in the construction of repeating or revolving and other pistols and fire-arms.

744. Luke Smith, of Littleborough, and Matthew Smith, of Heywood, for improvements in machinery for weaving and printing.

745. Thomas Hill, of Southampton, for certain improvements in springs, and also in the modes of their application to railway engines and carriages,—being a communication.

746. Samuel Newton, of Stockport, for a self-acting friction break to be applied to engines, carriages, and waggons used on railways.

747. Henry Lee Corlett, of Summer-hill, Dublin, for improvements in railway waggons.

748. Robert Heath, of Betley, Staffordshire, for improvements in railway breaks and signals.

749. Isaac Rider, of Bristol, for improvements in cocks for drawing off beer or other liquids.

750. Lawrence Frederick Keogh, of Liverpool, for improvements in looms for weaving.

751. John Gray, of Glasgow, for improvements in the application of heat for baking.

752. William Henham, of East Peckham, for improvements in ploughs.

755. John Pym, of Pimlico, for improvements in the permanent way of railways.

756. George Shaw, of Sheffield, for improvements in the manufacture of knives and forks.

757. Julian Bernard, of Guilford-street, Russell-square, for certain improvements in boots, shoes, and clogs, and in the machinery or apparatus and materials connected therewith.

758. John Coope Haddan, of Bloomsbury-square, for improvements in railway carriages.

The above bear date March 29th.

759. Martin Billing, of Birmingham, for a new or improved method of constructing the walls of houses, hot-houses, and other buildings; which said method is also applicable to the construction of fences.

760. William Henham, of East Peckham, for certain improvements in regulating the draft in chimneys and other outlets for smoke, air, and vapours.

762. James Bowron, of South Shields, for improvements in the manufacture of crown, sheet, plate, and bottle-glass.

763. Christopher Nickels, of the York-road, for improvements in weaving narrow fabrics.

764. Robert Dalglish, of Glasgow, for an improvement in dyeing.

765. John Carter Ramsden, of Bradford, for improvements in looms for weaving.

766. Joseph Xavier Villiet, aîné, of Paris, for certain improvements in the production of aerated liquids.

767. James Houston, of Dunfermline, for improvements in weaving.

768. James Worrell, jun., of Salford, for certain improvements in the method of preparing, treating, and finishing certain textile fabrics called cords, thicksets, velveteens, and beaverteens.

769. Lot Faulkner, of Cheadle, for certain improvements in the method of obtaining motive power.

The above bear date March 30th.

770. William Augustus Pascal Aymard, of South-street, for certain improvements in applying to illuminating the extract of bituminous products of coal, peat, and lignites, and in rectify-

ing and epurating the essences and greasy matter from coal,—being a communication.

771. Joseph Rylands, of Kingston-upon-Hull, for improvements in yards and spars of ships and other vessels.

772. Robert Mc Gavin, of Glasgow, for improvements in the construction of ships' masts, yards, booms, and in spars.

773. George Hanson, of Huddersfield, and David Chadwick, of Salford, for improvements in apparatus for measuring gas, water, and other fluids; which improvements are also applicable for obtaining motive power.

774. John Radcliffe, of Bradford, Lancashire, for improvements in looms for weaving.

The above bear date March 31*st.*

775. George Fergusson Wilson, of Belmont, Vauxhall, and James Freeman Lee, of the same place, for improvements in the manufacture of night-lights and their cases.

776. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating certain oily matters, and in the manufacture of oil.

777. Bartholomew Brittain, of Waterloo-road, for improvements in the means of supporting or retaining bedsteads or other articles of furniture in their proper positions.

779. William Crofts, of Derby-terrace, Nottingham Park, for improvements in weaving.

780. Jonathan Saunders, of St. John's Wood, for improvements in the manufacture of railway tyres.

781. Henry Spencer, Henry Tattersall, and Hugh Simphson, all of Rochdale, for certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous materials.

782. Robert Evans Peterson, of Tottenham-court-road, for an improved piston,—being a communication.

783. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in the manufacture of cloths, and in the preparation of wool.

784. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating certain greasy matters, and in the manufacture of candles.

785. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in the manufacture of night-lights, and in apparatus to be used therewith.

The above bear date April 1*st.*

787. George Holcroft and William Jennings Hoyle, both of Manchester, for certain improvements in steam-engines.

788. George Robb, of Glasgow, for improvements in the manufacture of sulphuric acid, alkalis, and other salts.

789. Nicolas Ferdinand Barthelemy, of Paris, for improvements in apparatus for sharpening razors.

790. Albion Richard Snelling, of Tottenham, for an improved emigrants' habitation cart.

791. Christopher Garman Rosenkilde, of Christiansand, Norway, for improvements in window sash-fastenings.

792, Frederick William Mowbray, of Bradford, Yorkshire, for improvements in doubling wool and other fibrous substances.

The above bear date April 2nd.

793. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in engines to be worked by air or gases,—being a communication.

794. James Findlow, of Manchester, for improvements in beds or couches for sick persons.

795. Joseph Palin, of Liverpool, for improvements in apparatus applicable to evaporation and distillation.

796. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in producing plates or surfaces, which may be used as printing or embossing surfaces, or as door-plates, dial or number-plates, or other plates or surfaces bearing inscriptions or devices of various kinds,—being a communication.

797. William Beckett Johnson, of Manchester, for improvements in steam-engines, and in apparatus connected therewith.

798. Robert William Sievier, of Upper Holloway, and James Crosby, of Manchester, for improvements applicable to looms for the manufacture of textile fabrics.

799. Jesse Ross, of Keighley, and Thomas Robert Hafford Ross, of Leicester, for certain improvements in machinery or apparatus for combing wool, cotton, silk, flax, and other suitable fibrous materials.

800. George Henry Brockbank, of Crawley-street, Oakley-square, for improvements in horizontal piano-fortes.

801. William Walker, of Leeds, for improvements in drying malt.

802. Moses Poole, of Avenue-road, for improvements in winding silk from the cocoon,—being a communication.

803. Francis Steigewald, of Munich, for improvements in the manufacture of glass and porcelain.

804. Charles May, of Great George-street, for improvements in machinery for manufacturing and rolling iron.

805. Francis Steigewald, of Munich, for improvements in heating furnaces.

806. Antoine Burq, of Paris, for certain instruments, apparatus, and articles for the application of electro-galvanic and magnetic action for medical purposes.

807. John Lawson, of Biggar, Lanarkshire, for improvements in the suspension and management of ships' boats.

808. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for an improved construction of self-inking stamping apparatus,—being a communication.

The above bear date April 4th.

810. William Mavity, of Birmingham, for a new or improved method of manufacturing letters and figures, to be used as printing-type, lettering for sign and window-boards, and other such like purposes.

812. George Purcell, of Cork, for a new method of adjustment in the art of printing, by means of certain combinations of various sized spaces and quadrats.

814. James Long, of Gorleston, for an improved method of setting up and adjusting ships' rigging of all tonnage.

815. Smith Flanders, of Wingham, for certain improvements in the construction of ploughs.

816. Joseph Haley, of Manchester, for improvements in machiney or apparatus for forging, stamping, and cutting iron or other substances; which machinery or apparatus is commonly called a "steam hammer."

817. William Pidding, of the Strand, for improvements in the manufacture of woven, textile, or other fabrics, and in the machinery or apparatus connected therewith.

818. William Johnson, of Lincoln's-inn-fields, for improvements in weaving, and in the machinery employed therein,—being a communication.

819. Thomas Carr, of Chowbent, for improvements in nails and other fastenings, and in the machinery or apparatus employed in the manufacture thereof.

820. John Thomas, of Caen, for improvements in apparatus for the manufacture of gas and coke.

821. William Pidding, of the Strand, for improvements in the preparation or treatment of twine or other threads, or cuttings of paper or other waste for the production of useful and ornamental articles.

The above bear date April 5th.

822. Edward Simons, of Birmingham, for improvements in telegraphing or communicating signals.

823. Frederick Albert Gatty, of Accrington, for improvements in printing or producing colours on textile fabries.

824. James Jerram Pratt, of Long Eaton, for certain improvements in stockings.

825. Henry Leachman, of Compton-terrace, Islington, for improvements in the manufacture of iron,—a communication.

826. Henry Alfred Jowett, of Sawley, for improvements in apparatus for heating; which improvements are particularly applicable for generating steam, or evaporating solutions, and may be applied for heating purposes generally.

827. William Radford, of Buckingham-street, for improvements in the construction of metallic beams or bracings and metallic sheets or plates, applicable to the building of ships and other structures where lightness and strength are required.

828. William Johnson, of Lincoln's-inn-fields, for improvements in the production of ornamental surfaces in glass, porcelain, metals, and similar materials,—being a communication.

829. William Johnson, of Lincoln's-inn-fields, for improvements in the manufacture of safety paper,—being a communication.

830. Samuel Denison and Henry Dean Denison, both of Leeds, for improvements in rating, breaking, and scutching flax, hemp, and other fibrous matters.

The above bear date April 6th.

831. John Fry Heather, of Woolwich, for a pneumometer for determining the densities or specific gravities of gases.

832. William Augustus Pascal Aymard, of South-street, for certain improvements in the preparation for, and application to, the manufacture of candles, and other purposes, of certain fatty and resinous bodies or substances,—a communication.

833. William Morgan, of Birmingham, for improvements in paper and cardboard cutting machines.

834. John Grist, of the New North-road, for improvements in machinery for the manufacture of casks, barrels, and other similar vessels.

835. Frederick William Mowbray, of Bradford, for improvements in apparatus used in preparing and combing wool, and other fibrous materials.

836. William Henry Wells, Edward Mann, and John Harman, all of Wandsworth, for improvements in grinding wheat and other grain.

837. Edward Langdon Bryan, of Hoxton, for improvements in warming and ventilating rooms and buildings.

838. Colin Mather, of Salford, for improvements in power looms.

839. Robert Pattison Clark, of Lambton Collieries, for improvements in machinery for loading and unloading colliers, and other ships and vessels.

840. Frederick Le Mesurier, of Pau, France, for improvements in apparatus for measuring and indicating a given period of time.

841. Leopold Joseph Green, of Leatherhead, Surrey, for improvements in axletree boxes.

842. Christopher Nickels, of York-road, for improvements in machinery for masticating, kneading, or grinding India-rubber, gutta-percha, and other matters.

843. William Fuller, of Jermyn-street, for improvements in ice-pails or apparatus for refrigerating.

The above bear date April 7th.

844. George Frederic Goble, of Great Fish-street-hill, for improvements in safety valves for steam boilers and gas chambers.
846. William Moseley, of Cumberland-terrace, Regent's-park, for a new method of railway traction, to be called a pony railway.
847. George Humphrey, of Brighton, for an improved self-acting safety valve, for locomotive, marine, and other steam boilers.
848. Alexander Samuel Braden, of High-street, Islington, for improvements in apparatus for roasting coffee, cocoa, and other vegetable matters, and for cooling the same when roasted.
849. Jean Joseph Theodore Pratviel, of Paris, for an improved machine for doubling, twisting, and reeling fibrous substances.
850. Patrick Francis Flanagan, of Liverpool, for improvements in the manufacture of hats for yachting and general purposes.
851. Henry Oliver Robinson, of Moorgate-street, for improvements in machinery for crushing sugar canes.
852. George Herbert, of Summer-hill, Dartford, for improvements in constructing and mooring light vessels, buoys, and other similar floating bodies.
853. Joshua Farrar, of Marsden, for improvements in the treatment of flax, line, grasses, and other fibrous substances.
854. Stephen Taylor, of New York, for improved machinery for weaving seamless goods,—being a communication.

The above bear date April 8th.

855. George Frederic Goble, of Fish-street-hill, for improvements in machinery to be actuated by water or air.
857. Herbert Taylor, of Mark-lane, for improvements in ornamenting surfaces or fabrics applicable to various useful purposes, such as for covers of furniture, imitation tapestry, carpets or hangings,—being a communication.
858. Adolphe Marius Alexandre Iglesia, of Russell-place, Fitzroy-square, for improvements in producing ornamental glass surfaces.
859. William Penn Cresson, of Philadelphia, for improvements in lathes, and parts connected therewith, for the purpose of reducing and smoothing the surfaces of certain metal wares,—being a communication.

The above bear date April 9th.

860. John Boydell Gibson, of Leicester-square, for improvements in saddlery and harness.
861. John Fuller Boake and John Reily, both of Dublin, for improvements in signal-posts for railways, and apparatus connected therewith.
862. Robert Bostwick Ruggles, of Paterson, State of New Jersey, and Lemuel Wright Serrell, of New York, for improvements in machinery for beating gold and other laminæ of metal.
863. Robert Garrard and John Garrard, both of Loman-street, Southwark, for improvements in bonnets.

864. William Urquhart, of Great Queen-street, for improvements in the manufacture of printers' type, and other articles used in letter-press printing.
865. William Russell Palmer, of Elizabeth City, North Carolina, for improvements in the construction and arrangement of machines for the application of horse-power, which he designates as "Palmer's improved horse-power."
866. William Russell Palmer, of Elizabeth City, North Carolina, for improvements in machines for threshing seeds and grains, and for cleaning them from the straw and chaff after they are threshed, which he designates as "Palmer's American seed and grain thresher and winnower."
867. Hugh Donald, of Johnstone, Renfrew, for improvements in machinery for cutting and uniting metals.
868. William Muir Campbell, of Glasgow, for improvements in earthenware kilns.
869. Donald Nicoll, of Regent-street, for improvements in garments, and in sewing or uniting the seams of the same.

The above bear date April 11th.

870. Samuel Russell and Robert Murray Mc Turk, of Sheffield, for improvements in metallic handles for table cutlery, daggers, and such like instruments.
871. Henry Blake, of Brighton, for improvements in railway-wheels.
872. Richard Archibald Brooman, of Fleet-street, for improvements in grinding and pulverizing gums, gum-resins, and other drugs and articles of similar character,—being a communication.
873. Alexander Turiff, of Paisley, for improvements in the prevention of accidents on railways.
874. Henry William Harman, of Northfleet Dockyard, for improvements in steam-engines.
875. James Taylor, of Carlisle, Isaac Brown, of the same place, and John Brown, of Oxford-street, for improvements in the manufacture or production of charred peat.
876. Auguste Mondollot, of Paris, for improvements in filling vessels with aerated waters, and the apparatus employed therein, —being a communication.
877. Downes Edwards, of Ravenscliffe, for improvements in signal apparatus for railways.
878. Thomas Greenwood, of Little Alie-street, for improvements in evaporating saccharine fluids.
879. Richard Greville Pigot, of George-street, Croom's-hill, Greenwich, for improvements in caltraps for military purposes.
880. François Felix Verdié, of Lorette, Loire, France, for certain improvements in welding cast steel with iron, steel, cast-iron, and other metals.
881. Robert John Kaye, of Bury, and John Ormrod Openshaw,

of Roach-mount, near Bury, for improvements in obtaining motive power by electro-magnetism.

882. Eliza Cunnington, of Devizes, for improvements in the decoration of furniture panels and other surfaces.

883. John Smith, of Bartholomew-close, for an improved mode of suspending carriage bodies.

884. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improvements in steam boilers, and in the mode of supplying the same with water,—being a communication.

The above bear date April 12*th.*

886. Nathaniel Clayton and Joseph Shuttleworth, of Stamp End Ironworks, Lincoln, for an improvement in portable and locomotive steam-engines.

888. William Pearce, of Arlington-street, Myddelton-square, for improvements in the construction of locomotive engines, parts of which improvements are applicable to other engines,—being a communication.

890. James Noble, of Leeds, for improvements in preparing cotton and other fibres.

892. Francis Burden, of Belfast, for improvements in treating rovings for spinning.

894. James Noble, of Leeds, for improvements in preparing cotton and other fibres.

The above bear date April 13*th.*

List of Patents

Granted for SCOTLAND, from the 22nd March to the 22nd April, 1853.

To John James, of Leadenhall-street, London, manufacturer, for certain improvements in weighing machines and weighing cranes.—Sealed 28th March.

Melchior Colson, of 4, South-street, Finsbury, London, civil engineer, for certain improvements in the construction of vehicles. —Sealed 28th March.

Josiah George Jennings, of Great Charlotte-street, Blackfriars-road, London, brass-founder, for improvements in water-closets, in taps and valves, and in pumps.—Sealed 29th March.

Henry Clayton, of the Atlas Works, Upper Park-place, Dorset-square, London, for improvements in the manufacture of tubes, pipes, tiles, and other articles made from plastic materials.—Sealed 29th March.

Charles Augustus Preller, of Abchurch-lane, London; John Eastwood, of Bradford, wool-comber; and Samuel Gamble, of Bradford, for improvements in machinery for combing,

drawing, or preparing wool, cotton, silk, hair, and other fibrous materials.—Sealed 30th March.

David Blair White, of Newcastle-upon-Tyne, M.D., for an improved mode of ballasting and stowing cargo in ships and other vessels.—Sealed 30th March.

Edward Moride, of Nantes, France, for certain improvements in tanning.—Sealed 5th April.

Richard Archibald Brooman, of Fleet-street, London, for improvements in the manufacture of manure.—Sealed 6th April.

John White and Robert White, of Cowes, Isle of Wight, for improvements in ship-building.—Sealed 6th April.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, London, for improvements in the manufacture of boots and shoes; parts of which said improvements are also applicable to the manufacture of various other articles of dress,—being a communication.—Sealed 12th April.

Stephen Taylor, of the City and State of New York, United States of America, for certain improvements in the construction of fire-arms and in cartridges for charging the same,—being a communication.—Sealed 12th April.

Everard Henry Jackson, of Litchfield-street, Soho, London, machinist, for improvements in producing artificial light, and also in producing motive power.—Sealed 15th April.

New Patents.

Sealed under Patent Law Amendment Act, 1852.

7. John Henry Gardner, of Poppin's-court, London, for improvements in toilet tables.—October 1.

26. John Macintosh, of Berners-street, for improvements in evaporation.—October 1.

42. Oswald Dodd Hedley, of Newcastle-upon-Tyne, for improvements in getting coal and other minerals.—October 1.

44. James Hodgson, of Liverpool, engineer and iron shipbuilder, for improvements in machinery for draining land.—October 1.

50. Walter Henry Tucker, of Fore-street, Tiverton, for certain improvements in locks (applicable to locks for all purposes), by which they can be made so as to combine increased and perfect security with simplicity and cheapness of construction.—October 1.

52. Walter Mc Lellan, of Glasgow, North Britain, iron merchant, for improvements in the manufacture of rivets and in working in metals.—October 1.

63. John Fordham Stanford, of Dover, architect and civil engineer, for improved machinery and apparatus for manufac-

turing bricks, tiles, and similar building materials, which is hereby denominated "the complete brickmaker."—October 1.

66. George Holmes, of Great Queen-street, for certain improvements in the manufacture or construction of coats, capes, and other upper garments of personal attire.—October 1.

68. George Ellins, of Droitwich, for an improved method and apparatus for preparing flax straw for dressing and cleaning.—October 1.

69. William Moore, of Birmingham, in the county of Warwick, gun-maker, and William Harris, of Birmingham, aforesaid, for an improvement in repeating pistols and rifles.—October 1.

72. Edward Wilkins, of Queen's-row, Walworth, for improvements in the distribution and application of water or other liquid manure to promote vegetation.—October 1.

73. Edward Wilkins, of Queen's-row, Walworth, for improvements in ruling and folding the leaves of account-books or other books used for mercantile purposes, and in making entries therein, and delivering vouchers therefrom, with accuracy and dispatch.—October 1.

82. Henry Mortlock Ommanney, of the City of Chester, Esq., for improvements in certain parts of machinery for spinning cotton and other fibrous substances.—October 1.

83. Henry Mortlock Ommanney, of the City of Chester, Esq., for an improved furnace for melting of metals in crucibles.—October 1.

89. James Nichols Marshall, of Bideford, for an improved wheel for carriages and other vehicles.—October 1.

91. William Walker, of Liverpool, patent agent, for improvements in wheels for railway carriages, and in the mode or modes of manufacturing the same.—October 1.

92. Thomas Lawes, of the City-road, for improvements in the manufacture of agricultural implements, or an improved agricultural implement.—October 1.

93. Thomas Lawes, of the City-road, for an improved quilt or coverlid.—October 1.

94. Thomas Lawes, of the City-road, for improvements in generating steam.—October 1.

104. Martyn John Roberts, of Gerrard's-cross, Bucks, for improvements in the manufacture of oxides of zinc and tin.—October 1.

110. John Wright and Edwin Sturge, of the Cornwall-road, Lambeth, for improved machinery for the manufacture of envelopes.—October 1.

111. John Remington, of Chelsea, and Zephaniah Deacon Berry, of Victoria-road, Pimlico, for improvements in gas-meters, or apparatus for measuring gas or other elastic fluids.—October 1.

131. Henry Mortlock Ommanney, of the City of Chester, Esq., for an improvement in the manufacture of guns, cannon, and other ordnance.—October 1.

132. Henry Mortlock Ommanney, for an improvement in the manufacture of cylinders for hydraulic presses and other engines.—October 1.

133. Henry Mortlock Ommanney, for an improvement in the manufacture of wheels for railway carriages.—October 1.

134. Henry Mortlock Ommanney, for an improvement in the manufacture of stamp-heads for crushing ores.—October 1.

139. William Lewis, of Piccadilly, for improvements in compounding medicines in the form of pills.—October 1.

142. Henry Bernoulli Barlow, of Manchester, for improvements in the manufacture of cylinders for carding cotton and other fibrous substances.—October 1.

143. John Lawrence Gardner, of Whitecross-street, for improvements in bottles and other vessels for holding liquids.—October 1.

144. William Seaton, of Pimlico, for improvements in the construction of iron vessels, and in sheating or covering the same.—October 1.

147. Edwin Whele, of Shiffnal, Salop, for improvements in apparatus for burning candles, and in horological apparatus attached thereto.—October 2.

148. Edward William Kemble Turner, of Paddington, for certain improvements in machinery for sweeping or cleaning chimneys; also for more effectually extinguishing them when on fire.—October 2.

156. Joseph Brown, of Leadenhall-street, for improvements in beds, sofas, chairs, and other articles of furniture, to render them more suitable for travelling and other purposes.—October 2.

165. Moses Poole, of Serle-street, for improvements in constructing bridges, viaducts, and such like structures.—October 2.

170. Edward Allport, of Aldermanbury, for an improvement in the manufacture of buttons, by making them with elastic shanks.—October 2.

171. William James Lewis, of Turin, for a slideless stadia sight, applicable to rifles and other fire-arms.—October 2.

173. Theophilus Kedwood, of Montague-street, London, for improvements in the manufacture of gelatine.—October 2.

176. Peter Hyde Astley, of Stratford, and John Figgins Stephens, of De Beauvoir-square, for an improved construction for floating vessels, having for its object the rendering them safe means of transit.—October 2.

180. John Slack, of Manchester, manager, for improvements in the manufacture of textile fabrics.—October 2.

205. Martin Billing, of Holborn, and Charles Henry Street, of Birmingham, for certain improvements in the combination of metals, having different capacities of vibration, to be used in the construction of certain useful articles.—October 4.

222. Aristide Balthazar Berard, of Paris, for improvements in the construction of jetties, break-waters, and docks, and other hydraulic constructions.—October 5.

225. Joseph Apsey, of Blackfriars, for improvements in ship-building, and in machinery for propelling.—October 5.

227. Benjamin Mitchell, of Romsey, for improvements in the construction of artificial legs.—October 5.

239. Pierre Frederick Gougy, of Leicester-square, for improvements in paving streets, roads, and ways.—October 5.

242. William Mackenzie, of Glasgow, and George Blair, of the same place, for improvements in the arrangement and construction of graduated scales for measuring instruments.—October 5.

254. Robert Shaw, of Portlaw, Ireland, for pre-arranging, ascertaining, and registering the rate of travelling of locomotive engines, and of railway or other carriages.—October 6.

264. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in apparatus for manufacturing gas and coke.—October 6.

282. John Blair, of Ducie Bridge Mill, Manchester, for certain improvements in the manufacture of waddings, and in the machinery for making the same.—October 7.

283. Thomas Greaves, of Manchester, for improvements in the method or means of obtaining and employing motive power.—October 7.

284. George Simpson, of Manchester, for certain improvements in machines or apparatus for weighing.—October 7.

288. Augustus Waller, of Bonn, for improvements in the means of measuring or ascertaining the quantity of alcohol, and other substances, in brandy, wine, beer, and other liquids.—Oct. 7.

289. John Tatham and David Cheetham, of Rochdale, for improvements in rollers or bosses used for drawing or conveying textile materials and fabrics.—October 7.

292. Samuel Rainbird, of Norwich, for improvements in grappling and raising sunken vessels and other submerged bodies, and in apparatus for that purpose.—October 7.

299. Thomas Pascall, of Norwood, for improvements in ridge tiles and roofing.—October 8.

302. William Townley, of Bartlett's-buildings, for improved machinery or apparatus for watering and flushing streets, squares, courts, and other localities.—October 8.

313. John Egan, of Limerick, for a self-acting flax scutching and hackling machine, with horizontal blades or hackles; an incline plane on which flax-holders move; the application of the fan by a current of air to press flax against scutching blades or hackles; and spring-catch flax-holders, as per drawing.—October 9.

319. James Johnson, of Worsley, for improvements in heating, ventilating, and sewering cottages or dwelling-houses.—October 9.

324. Thomas Restell, of the Strand, for certain improvements in chronometers, watches, and clocks; part of which improvements is applied to roasting-jacks.—October 9.

326. Charles William Siemens, of Adelphi-terrace, for improvements in engines to be worked by steam and other fluids.—October 9.

329. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in the construction of revolving or repeating fire-arms.—October 9.

344. Samuel Perkes, of Walbrook, for improvements in certain apparatus and machines for the production and treatment of mineral and other substances; and part of which are applicable for other useful purposes.—October 12.

346. Samuel Perkes, of Walbrook, for certain improvements in mines, buildings, and sewerage, for effecting sanitory purposes; and treating the produce therefrom.—October 12.

359. Léon Godefroy, of Paris, for improvements in covering or packing rollers for printing fabrics.—October 12.

362. William Tatham, of Rochdale, for an improved mode or improved modes of preventing accidents on railways.—Oct. 13.

366. Joseph Nash, of Thames-parade, Pimlico, for the treatment and refining of sugar.—October 13.

371. Walter Mc Farlane, of Glasgow, for improvements in water-closets.—October 13.

374. Christopher Hill, of the Great Western Railway, Swindon, for improvements in the manufacture of lubricating matters.—October 13.

375. Gerard Andrew Arney, of Mitcham, for improvements in coating or enamelling pictures, prints, paper, and other surfaces.—October 13.

379. John Henry Lee, of Northampton-square, for improvements in sawing.—October 13.

383. Donald Grant, of Luton-place, Greenwich, for improvements in the means of applying the heat derived from the combustion of gas.—October 14.

394. Robert Hawkins Nicholls, of Bedford, for the invention for horse-hoeing land.—October 15.

396. James Lochhead, of Kennington, and Robert Passenger, of Union-street, Southwark, for certain improvements in the manufacture of glass and other vitrified substances, and in ornamenting and annealing the same.—October 15.

397. Henry Moseley, of Wandsworth, for a machine to be driven by the pressure of a fluid, or to displace a fluid, or to measure it.—October 15.

405. Allan Edwin Hewson, of Birmingham, for certain improved modes or processes for making buttons, beads, and other ornaments of dress.—October 15.
406. Andrew Blair, of Mary Hill, Lanark, for improvements in printing or ornamenting fabrics.—October 15.
408. William James Matthias and Thomas Bailey, of Clerkenwell, for improvements in clocks and watches.—October 15.
417. Pierre Augustin Puis, of Paris, for an improved chain or cable, and an apparatus employed therewith for certain applications.—October 16.
421. Charles Reeves, junior, of Birmingham, for an improvement or improvements in the manufacture of knives.—Oct. 18.
422. George Randfield Tovell, of Mistley, and John Mann, junior, of Colchester, for improvements in the construction of ships and other vessels.—October 18.
424. John Henry Johnson, of Lincoln's-inn-fields, for improvements in drying, and in the machinery or apparatus to be used therein.—October 18.
429. William Harcourt and Joseph Harcourt, of Birmingham, for certain improvements in the construction and manufacture of match-boxes.—October 18.
431. Henry Hughes and George Firmin, of Plough-road, Rotherhithe, for improvements in the manufacture of lamp black, and in recovering from such manufacture a substance suitable for fuel.—October 18.
436. Robert Mole and Robert Mole, jun., both of Birmingham, for improvements in the manufacture of swords and matchets. —October 19.
437. Arthur James, of Redditch, Worcester, for an improvement or improvements in needle-cases or wrappers,—October 19.
439. Martin Walter O'Byrne and John Dowling, both of Burr-street, for a machine for cutting paper, mill-board, leather, vellum, sheet-metals, and other suitable materials, for useful and ornamental purposes.—October 19.
443. William Chisholm, of Holloway, for improvements in obtaining caustic soda and other substances from the residues of articles used in the purification of gas.—October 19.
444. Gabriel Benda, of Basinghall-street, for improvements in apparatus for obtaining fire for smokers.—October 19.
445. George Gotch, of King-street-terrace, Islington, for certain improvements in transmitting intelligence upon railways.—October 19.
449. John Jones, of Sheffield, for improvements in handles for knives, razors, and other like instruments.—October 19.
454. Charles Clarke, of Preston-street, Brighton, and John Gilbert, of Hyde-place, Hoxton, for improvements in the supply and distribution of water and other fluids.—October 20.
458. Peter Evans Donaldson, of Shrewsbury, for improvements in dams, locks, and lock-gates.—October 20.

459. Charles Weightman Harrison and Joseph John Harrison, both of Richmond, for improvements in protecting insulated telegraphic wires.—October 20.

461. Thomas Henry Biddles, of Mansfield-road, Nottingham, and John William Duphrate, of Radford, for improvements in machinery for the manufacture of textile and looped fabrics.—October 20.

462. Jacob Tilton Slade, of Pall-mall, for an improved hoisting apparatus.—October 20.

465. Joseph Cundy, of Victoria-grove, Kensington, for improvements in hot-air stoves.—October 20.

470. William Lukyn, the elder, of Nottingham, for a liquid draught detector, or self-measuring tube, with a union conveyauce tap and its stock and time-table.—October 21.

472. Joseph Rose, of Aldersgate-street, for improvements in locks.—October 21.

473. Julian Bernard, of Guildford-street, Russell-square, for improvements in the production of ornamental surfaces upon leather.—October 21.

477. Henry Charles Gover, of Princes-street, Bedford-row, for improvements in the apparatus used in printing with colors.—October 21.

484. George Ellins, of Droitwich, for an improved method and apparatus for dressing and cleaning flax straw.—October 22.

486. Julien Boilesve, of Brompton, for an improved mode of preserving vegetable substances and animal coatings.—Oct. 22.

488. Juliana Martin, of Soho-square, London, for an improved apparatus for artificial hatching.—October 22.

490. Stanislaus Hoga, of Nassau-street, for improvements in separating gold from the ore.—October 22.

492. John Holmes, of Manchester, for improvements in lathes.—October 23.

494. Philip Berry, of Manchester, for certain improvements in machinery or apparatus for manufacturing bolts and nuts, and other similar articles in metal.—October 23.

495. David Crichton, of Manchester, for arrangements and apparatus for producing continuous circular motion, giving a series of different velocities obtained from alternate motions, applicable to looms and other machines.—October 23.

499. James Brodie, of Bow of Fife, for certain improvements in the construction of sea-going vessels.—October 23.

504. George Kennedy Geyelin, of Camden-town, for an improved machine for grinding pigments or other vegetable or mineral substances.—October 23.

505. William Macbay, of Woolwich, for improvements in extinguishing fire in dwellings, factories, and other buildings, and inships.—October 23.

520. Claude Mamés Augustin Marion, of Paris, for a new kind of damper for moistening stamps and paper.—October 26.
524. Charles Rowley, of Birmingham, for certain improvements in nails.—October 26.
526. James Nasmyth, of Stafford-street, Bond-street, for an improved mode of utilizing running waters.—October 26.
527. Joseph Charles Frederick Baron de Kleinsorgen, of Little New-street, for an improved apparatus for indicating the variation of the magnetic needle.—October 26.
535. James Conry, of Manchester, for improvements in umbrellas and parasols.—October 27.
537. William Robert Bertolacci, of Paris, for an improved pneumatic ink and pen-holder.—October 27.
541. Thomas Wilks Lord, of Leeds, for improvements in safety and other lamps.—October 27.
545. Charles Benjamin Normand, of Havre, for improvements in machinery for sawing wood.—October 27.
546. James Nasmyth, of Stafford-street, Bond-street, for improvements in the mode of obtaining and applying motive power.—October 27.
547. James Henry Smith, of Connaught-terrace, London, for improvements in corsets.—October 27.
548. William Thorp, of Collyhurst, near Manchester, for certain improvements in steam-boxes, and the mode of heating press-plates used in hot-pressing of silks, de-laines, cobourgs, merinos, fancy goods, and other similar fabrics.—October 28.
567. Richard Archibald Brooman, of Fleet-street, for improvements in violins and other similar stringed musical instruments.—October 29.
572. Henry Brinsmead, of Saint Giles in the Wood, Devonshire, machine maker, for an invention for shaking straw, to be attached to thrashing machines.—October 30.
581. Julian Bernard, of Guildford-street, Russell-square, for improvements in the manufacture of glass.—October 30.
583. Richard Archibald Brooman, of Fleet-street, patent agent, for improvements in revolving fire-arms.—October 30.
607. Francis Daniell, of Camborne, Cornwall, for improvements in stamp-heads.—November 1.
626. Charles Phillips, of Bristol, for improvements in apparatus or machinery for reaping or cutting crops of corn, or other crops to the cutting of which reaping machines are applicable.—November 3.
630. Henry Spencer, of Rochdale, and Edmund Taylor, of the same place, for improvements in steam-engines and boilers.—November 3.
631. Harrison Blair, of Colthurst, Yorkshire, for improvements in apparatus for supplying steam-boilers with water.—Nov. 3.

634. Emily Pettit, of Brompton-crescent, Brompton, in the county of Middlesex, for a musical instrument, which she calls a "Euphotine."—November 4.

640. Marc Klotz, of Paris, for an improved process and apparatus to be employed in ornamenting fabrics, leather, paper, and other surfaces.—November 4.

649. Andrew Lawson Knox, of Glasgow, for improvements in the manufacture or production of ornamental fabrics.—November 5.

728. George Stenson, of Northampton, for improvements in apparatus for separating gold from auriferous sand and earth. —November 12.

730. George Philcox, of Winchester-buildings, London, for improvements in marine chronometers and other time-keepers. —November 13.

731. Edward Davy, of Crediton, for improvements in the preparation of flax and hemp.—November 13.

736. Somerville Dear, of Leeds, for certain improvements in the arrangement and apparatus of looms for weaving centre or other large patterns or designs in linen, cotton, silk, wool, or other fibrous materials.—November 13.

743. Peter Forbes, of Shettleston, Lanark, for improvements in sowing or depositing seeds in the earth.—November 13.

756. Francis Montgomery Jennings, of Cork, for improvements in preparing flax, hemp, china-grass, and other vegetable fibrous substances.—November 15.

780. James Potter, of Manchester, for improvements in machinery for spinning cotton and other fibrous substances.—November 19.

784. Robert Walker, of Glasgow, for improvements in the construction of portable houses and other erections.—Nov. 19.

811. Benjamin Walker and William Bestwick, of Salford, for improvements in the manufacture of braid and the machinery or apparatus employed therein.—November 22.

876. Jean Hyppolite Salvan, ainé, of Paris, for certain improvements in the manufacture of paletôts and other articles of dress,—the said improvements being obtained by an improved process of felting and fulling.—November 26.

892. Daniel Woodall, of Oldbury, for improvements in canal boats.—November 27.

908. Francis William Ellington, of Drummond-street, for improvements in the making of screws for collapsible and other vessels.—November 29.

910. Jules Barse and Paul Gage, of Paris, for improvements in apparatus for manufacturing soda water and other aerated liquids, and likewise in the preparation of the substances employed therein.—November 29.

919. James Barlow, of King William-street, for improvements in stands or supports for casks, barrels, and other like vessels.—November 30.

936. John Norton, of Cork, for improvements in shot or projectiles.—December 2.

949. John Bethell, of Parliament-street, for improvements in machinery or apparatus for digging and cultivating land.—December 3.

954. Samuel Neville, of Gateshead, for improvements in the manufacture of lamp glasses and globes.—December 3.

958. Alexander Lawrie, of Chatham, for improvements in the manufacture of oars and similar articles.—December 4.

966. James Buchanan, of Glasgow, for improvements in the treatment of flax, and other similar vegetable fibrous substances, and in the machinery employed therein.—December 6.

982. Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for improvements in constructing the bars of furnaces and grates,—being a communication.—December 7.

986. James Norton, of Ludgate-hill, for an improved mode of transmitting motive power.—December 7.

987. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for an improved mode of transportation for the conveyance of letters, packages, freight, or passengers, from one place to another,—being a communication.—December 7.

996. John Symonds, of Glass House yard, and George Mouchet, of Battersea, for an improved mode of cleaning or scaling metallic surfaces.—December 8.

1015. John Sheringham, of Edwardes-square, Kensington, for improvements in the construction of stove-grates.—December 10.

1030. Stephen Green, of Princes-street, Lambeth, for improvements in joining earthenware tubes and pipes.—December 11.

1041. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improved apparatus for regulating the density of fluids,—being a communication.—December 13.

1048. James Bell, of Portobello, Mid-Lothian, for improvements in railway chairs.—December 14.

1053. Isham Baggs, of Liverpool-street, for improvements in obtaining or extracting gold and silver from their ores.—December 14.

1055. William Johnson, of Lincoln's-inn-fields, for improvements in apparatus for the manufacture of aerated waters,—being a communication.—December 14.

1056. John Henry Johnson, of Lincoln's-inn-fields, for improvements in wind-guards or chimney-tops,—being a communication.—December 14.

1057. Josiah George Jennings, of Great Charlotte-street, Black-

friars-road, for improvements in constructing drains.—December 14.

1064. Jean François Isidore Caplin, of Strawberry-hill, near Manchester, for improvements in apparatus for preventing or curing a stooping of the head or of the body.—December 15.

1079. Sir Francis Charles Knowles, of Lovell Hill, Berkshire, for improvements in the manufacture of iron.—December 16.

1082. Archibald Slate, of Woodside Iron Works, near Dudley, for an improvement in propulsion.—December 16.

1083. Archibald Slate, of Woodside Iron Works, near Dudley, for improvements in the production of motive power from elastic fluids.—December 16.

1084. Archibald Slate, of Woodside Iron Works, near Dudley, for improvements in propelling vessels.—December 16.

1085. James Dunlop, of Haddington, Scotland, for improvements in saddles.—December 16.

1086. George Michiels, of Holywell-street, for improvements in the manufacture and purification of gas.—December 16.

1090. Archibald Slate, of Woodside Iron Works, near Dudley, for certain improvements in the arrangements for working the slide-valve for the induction and eduction of fluids.—Dec. 17.

1091. Archibald Slate, of Woodside Iron Works, near Dudley, for an invention in steam-boilers.—December 17.

1101. Thomas Elliott, of Stockton-on-Tees, for improvements in steam-engines, which are also applicable to pumps.—December 18.

1119. Jean Baptiste Moinier, of Rue de Marseille, and Charles Constant Boutigny, of Rue de Flandre, La Villette, France, for improvements in concentrating syrups and other solutions, and in distillation.—December 21.

1120. Jean Baptiste Moinier, of Rue de Marseille, and Charles Constant Boutigny, of Rue de Flandre, La Villette, France, for improvements in distilling fatty matters.—December 21.

1121. George Beadon, of Creechbarrow, near Taunton, for improvements in constructing and propelling ships and vessels.—December 21.

1126. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in lamps, and in apparatus to be used therewith,—being a communication.—December 21.

1130. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improvements in the means of urging the fires and increasing the draft of furnaces, and in arresting the sparks given off from the chimneys of locomotive engines,—being a communication.—December 22.

1135. William Aspdin, of Blackwall, Gateshead-upon-Tyne, for improvements in the manufacture of Portland and other cements.—December 22.

1139. John Livesey, of New Lenton, for improvements in lace machinery, and in piled fabrics made from such machinery.—December 22.

1146. Nicolas Malinau, of Bordeaux, for improvements in stopping or covering bottles, decanters, pots, and other receptacles of glass, porcelain, and earthenware, and in the machinery connected therewith.—December 23.

1147. George Gwynne, of Hyde-park-square, and George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating fatty and oily matters.—December 23.

1153. John Hinks, and George Wells, both of Birmingham, for a new or improved pen-holder.—December 24.

1160. George Michiels, of Holywell-street, for improvements in the manufacture of gas.—December 24.

1163. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improvements in obtaining and applying motive power, —being a communication.—December 24.

1167. John Anderson, of Rugby, for heating and ventilating apartments, and for remedying smoky chimneys by a radiant ventilating grate.—December 27.

1170. George Fergusson Wilson, of Belmont, Vauxhall, for improvements in treating certain fatty bodies.—December 27.

1180. William Busfield, of Bradford, for improvements in apparatus for combing wool and other fibrous substances requiring like process.—December 28.

1182. James Webster, of Leicester, for improvements in the manufacture of springs.—December 28.

1186. John Copling, jun., of the Grove, Hackney, for a safeguard railway signal.—December 29.

1189. Benjamin Glorney, of Mardyke Mills, near Dublin, for improvements in obtaining and applying motive power.—December 29.

1191. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in the manufacture of carpets,—being a communication.—December 29.

1206. Robert Taylerson, of Newcastle-upon-Tyne, for improvements in ship-building.—December 30.

1209. Thomas Benjamin Smith, of Bristol, for improvements in calcining certain ores, and in the construction of furnaces for that purpose, and for converting certain products, arising in the process, into an article of commerce not heretofore produced therefrom.—December 31.

CELESTIAL PHENOMENA FOR MAY, 1853.

D.	H.	M.	
1			Clock after the ☉ 3m. 4s.
—			☽ rises 2h. 47m. M.
—			☽ passes mer. 7h. 12m. M.
—			☽ sets 11h. 45m. M.
	16	7	♀ in conj. with ♅ diff. of dec. 0. 33. S
3	4	6	♃'s first sat. will im.
5			Clock after the ☉ 3m. 29s.
—			☽ rises 4h. 0m. M.
—			☽ pass mer. 10h. 8m. M.
—			☽ sets 4h. 30m. A.
	6	8	☿ in conj. with the ☽ diff. of dec. 1. 41. N.
	14	34	♂ in conj. with the ☽ diff. of dec. 3. 55. N.
6	2	31	♃'s third sat. will im.
	20	52	♅ in conj. with the ☽ diff. of dec. 3. 13. N.
7	11	4	♀ in conj. with the ☽ diff. of dec. 2. 19. N.
	22	31	♄ in conj. with the ☽ diff. of dec. 0. 36. N.
8	4	6	Ecliptic conj. or ● new moon
	10	13	☿ greatest elong. 26. 6. W.
	15	0	☽ in Apogee
10			Clock before the ☉ 3m. 49s.
—			☽ rises 5h. 34m. M.
—			☽ pass mer. 1h. 45m. A.
—			☽ sets 10h. 9m. A.
11	14	22	♄ in conj. with the ☉
12	0	28	♃'s first sat. will im.
12	9	22	♀ in conj. with ♄ diff. of dec. 1. 26. N.
13	0	19	♃'s second sat. will im.
13	10	56	♀ in sup. conj. with the ☉
—			Occul. μ Cancri, im. 12h. 15m. em. 13h. 4m.
15			Clock before the ☉ 3m. 54s.
—			☽ rises 9h. 51m. M.
—			☽ pass mer. 5h. 57m. A.
—			☽ sets 1h. 20m. M.
16	5	57	☽ in □ or first quarter
	19	39	☿ in conj. with ♂ diff. of dec. 2. 34. S.
17			Mercury, R. A., 2h. 3m. dec. 9. 22. N.
—			Venus, R. A., 3h. 40m. dec. 19. 11. N.
17			Mars, R. A., 2h. 3m. dec. 11. 54. N.
—			Vesta, R. A., 5h. 7m. dec. 21. 21. N.
—			Juno, R. A., 5h. 16m. dec. 14. 4. N.
—			Pallas, R. A., 14h. 8m. dec. 24. 57. N.
—			Ceres, R. A., 14h. 20m. dec. 3. 6. S.
—			Jupiter, R. A., 17h. 27m. dec. 22. 40. S.
—			Saturn, R. A., 3h. 30m. dec. 16. 22. N.
—			Uranus, R. A., 2h. 29m. dec. 14. 20. N.
—			Mercury pass mer. 22h. 24m.
—			Venus pass mer. noon
—			Mars pass mer. 22h. 22m.
—			Jupiter pass mer. 13h. 44m.
—			Saturn pass mer. 22h. 36m.
—			Uranus pass mer. 22h. 45m.
19			Occul. 65 Virginis, im. 15h. 0m. em. 15h. 54m.
	8	9	☿ greatest hel. lat. S.
20			Occul. κ Virginis, im. 12h. 11m. em. 13h. 17m.
	2	53	♃'s second sat. will im.
21	19	26	☿ in conj. with ♅, diff. of dec. 2. 19. S.
22	7		☽ in Perigee
22	10	52	Ecliptic oppo. or ○ full moon
—			Occul. ξ¹ Scorpii, im. 8h. 31m. em. 9h. 30m.
23			Occul. b Ophiuchi, im. 16h. 34m. em. 17h. 35m.
24			Occul. λ Sagittarii, im. 14h. 41m. em. 15h. 26m.
25			Clock after the ☉ 3m. 23s.
—			☽ rises 11h. 26m. A.
—			☽ pass mer. 2h. 7m. M.
—			☽ sets 5h. 50m. M.
26	16	8	♂ in conj. with ♅, diff. of dec. 0. 6. S.
27	7	55	☿ in the ascending node.
	10	45	♃'s first sat. will im.
29	5	39	☽ in □ or last quarter
30	8	59	☿ in conj. with ♄, diff. of dec. 0. 33. N.

J. LEWTHWAITE Rotherhithe.

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No. CCLVIII.

RECENT PATENTS.

To SAMUEL GEORGE ARCHIBALD, *of Pall Mall, for an improved mode of extracting or rendering animal fats and oils.*—[Sealed 2nd October, 1852.]

THIS invention relates to a novel mode of treating fatty or oleaginous bodies, for the purpose of separating the fibrine or other extraneous matters therefrom, and obtaining a sound bright oil or tallow, according to the material operated upon.

In carrying out this invention, the patentee provides one or more steam-tight tanks, and connects the same to any ordinary steam-boiler, which is provided for the purpose of supplying them with steam at a high pressure. Into such a tank the material to be operated upon is placed; and, after being subjected to steam heat for the requisite period, the fat or oil is drawn off, and the refuse matters are discharged from the tank, through a suitable opening provided for the purpose.

When seal oil is required to be extracted or rendered, the fat is separated from the pelt of the seal in the ordinary manner, and placed in the tank through a man-hole, and the lid thereof is secured steam-tight. It is preferred to operate upon the animal matter while fresh, or before decomposition has commenced, or proceeded far; for, otherwise, the application of the steam heat will bring out a coloring property, which exposure to the air has imparted to the fat; and thus a dark-colored, instead of a bright pale oil, will be the result.

When whale oil is to be rendered, the blubber is cut into small pieces, and placed in the tank. Steam is then admitted

to the tank, and the pressure brought up to from 50 to 60 lbs. to the square inch. The heat to which this pressure is equivalent, will immediately act upon the cellular tissue or membrane of the material under operation,—causing the cells to burst, and the oil or fat to flow readily. The tissue, as well as all the animal fibre, will become dissolved; and, upon ebullition ceasing, the glutinous mass will, together with the condensed water, fall to the bottom of the tank.

The figure in Plate XI., shews, in elevation, an arrangement of apparatus which the patentee employs in carrying out his invention. A, A, is a strong cylindrical tank, constructed of the best boiler-plate iron, and having domed heads; this tank is set up on end, supported by brick-work; and, in connection therewith, is a high-pressure steam-boiler, B, B. *a*, is the man-hole through which the tank A, is filled, on the removal of the steam-tight door; *b*, is a try-cock; *c*, *c*, *c*, are cocks for drawing off the oil, constructed so that a hose can be coupled on to them; *d*, is a relieving-cock; *e*, is a safety-valve; and *f*, is a discharging-valve, having its seat in the bottom of the tank: its use is to discharge the residuum after the oil has been drawn off. The opening and the closing of this valve is effected by means of a hand-wheel *m*, at the top of the tank: this wheel is keyed to a rod *f**, *f**, which passes through a stuffing-box at the top of the tank, and is connected at its lower end to the valve *f*. The upper end of the rod *f**, is threaded, and works through a stationary threaded nut, carried by a cross-head: by turning, therefore, the hand-wheel to the right or the left, the valve *f*, will be raised or lowered, as required. *h*, is the cock for supplying steam to the tank A; and *k*, *k*, is the steam-pipe. This pipe is connected with a worm *k**, of the same size, coiled round the bottom of the tank: the under-side of the worm *k**, is perforated, to allow the steam to escape into the tank. In the upper part of the pipe *k*, a check-valve *l*, is provided, for the purpose of preventing the oil, while the steaming operation is continued, from rushing from the tank into the boiler, when the pressure of steam in the boiler is less than in the tank, which frequently happens on supplying the boiler with water. A strainer is provided at the back of the cocks *c*, *c*, *c*, to prevent the clogging of the orifices of the cocks. The branch steam-pipe *g*, and worm *i*, are not required when oil only is being extracted; but for rendering tallow or lard, this arrangement will be found very serviceable, either in keeping the tallow in a liquid state, after ebullition, by the open steam-cases, or in the event of the contents cooling in the

tank. When this occurs, by opening the steam-cock *j*, steam is let into, and allowed to circulate through, the worm *i*, *i*, and the tallow is quickly melted without disturbing the sediment.

Mode of Operating.

The discharging-valve *f*, being closed, and the cocks all shut, the tank is filled through the man-hole *a*, to within a short distance of the top; the remainder of the space being required for condensed water. The man-hole lid is then secured, and the steam is let into the tank from the steam-boiler, by the cock *h*. The time required in the operation will vary from eight to twelve hours, according to the substance under operation, and the degree of heat and pressure employed.

The try-cock *b*, should be carefully attended to during the operation,—for as long as it blows steam, the operation should be continued; but if it is found to spurt fatty contents, the tank should be relieved by drawing from the relief-cock *d*. This may, however, be prevented, by taking care not to overload the tank in the first instance.

During the operation, drawings may be taken from either of the cocks *c*, by coupling on a hose; but while taking drawings, the supply of steam should be cut off.

In the early stages of the operation, the condensed water, fat, and animal matter, will be found to combine, and some time will elapse before any oil shews itself; but as the process advances, the separation will take place more readily; and when the operation is near completion, the separation is very rapid: the test of completion is a ready separation of the water from the oil. All the animal fibre having by this time been deprived of fat, its gravity will have increased; and, on ebullition ceasing, it will readily drop from the oil, and combine with the water, after sufficient time has been allowed for the matters to settle: the pure oil will rest on the condensed water on the completion of the operation. When the steam is cut off, the try-cock *b*, and safety-valve, should be opened, to allow the steam in the tank to escape.

A small quantity of salt may be used without detriment to the oil, for the purpose of increasing the gravity of the water, and thereby causing a more speedy separation of the oil and water.

The patentee shews, in the drawings attached to his specification, an arrangement of apparatus suitable for a ship of from three to four hundred tons burden, wherein two cylin-

drical tanks A, are employed; and in other respects this marine arrangement is very similar to that before described.

The patentee claims, First,—the rendering of animal fats or oils, by submitting fatty or oleaginous animal matters to the action of steam heat, unedr pressure, in a closed tank. And, Secondly,—the employment, in the above-described process, of the arrangements of apparatus shewn in the drawings.

To DONALD GRANT, *of Luton-place, Greenwich, for improvements in the means of applying the heat derived from the combustion of gas.*—[Sealed 14th October, 1852.]

THIS invention relates to certain means of economizing the heat given off by the combustion of gas in a gas-stove. This object is in part attained, in stoves used for heating apartments, by passing currents of fresh air, taken direct from the outer atmosphere, up heated flues or pipes, which are open at top to allow of the air, when heated, to flow into the apartments. In cooking-stoves, the heat, which would otherwise pass off to the chimney, is utilized by surrounding a burner (such as that which is ordinarily employed for heating a stew-pan or boiling a kettle) with a coiled pipe, connected at both ends with a boiler or othei receptacle for liquid; and, by this means, a circulation is created in the liquid at the expense of the radiated heat, which would otherwise be lost,—the vessel, which is set above the burner, being heated by the direct action of the flame. A further economy of the heat given off by gas-burners is also effected by using glass or earthenware panels, of a peculiar construction, as hereafter explained.

In Plate XI., fig. 1, shews, in sectional elevation, the improved stove for heating apartments; and fig. 2, is a sectional plan, taken in the line A, B, of fig. 1. *a, a,* is the outer case, composed of a frame of angle iron, which is set upon a plinth *b,* made of wood, stone, or other bad conductor of heat, and is filled in with panels composed of slips of glass or earthenware *c,* piled up one upon the other, and forming a good non-conducting filling to the frame. The mode of constructing the panelling of the case will be best understood on inspecting figs. 3, which represent a panel in side and sectional edge view. The vertical bars of the metal frame are each provided with a groove, of sufficient width to receive the ends of two slips of glass or earthenware, when laid face to face. These slips are, by preference, not deeper than from two to three inches, and they are built up in the grooves in two lines,

arranged so that one line shall break joint with the other. The object of using these slips is to provide a means of rectifying, at a small expense, any damage that may arise to the panelling,—the probability being, that when an accident occurs thereto it will be confined to one or two slips, which may be readily replaced; instead of necessitating the insertion of a new panel, which is requisite when a single plate of non-conducting material is employed to fill a panel. At the bottom part of the stove, within the plinth *b*, is an air chamber, which is divided into two compartments *d*, *e*. These chambers are supplied with air by separate channels *d**, *e**,—the air being drawn direct from the outer atmosphere.

The air supplied by the channel or pipe *d**, to the compartment *d*, is intended to be heated and passed, in that state, into the apartment; and the air, fed by the pipe *e**, to the chamber *e*, goes to the burner to support combustion, and passes off, with the products of combustion, to the chimney. *f*, *f*, is the gas supply-pipe, and *g*, is the burner, which may be of any suitable construction. The top of the compartment *e*, of the air-chamber, is pierced with a ring of holes, as shewn in the plan view, fig. 2, for the admission of air to the burner; and holes are also made in the top of the compartment *d*, to allow of the passage of air upwards. Over these latter holes earthenware tubes *h*, *h*, are placed, for the purpose of conducting up the air to be heated, and passing it out at the top of the stove. These pipes project through a plate *i*, rivetted to the frame of the stove, and are held in position by that plate. Above the plate, and resting upon a ledge, provided to receive it, is a glass or earthenware cover *k*, (composed of slabs or tiles) and pierced with holes that are concentric with the tubes *h*, *h*, for allowing the air, which flows up those tubes, to escape into the apartment. A junction is made between the tubes and this cover by cap-pieces *l*, which fit on the tubes and into the holes in the cover *k*; or the tubes themselves may be continued to the cover and cemented thereto. Suspended over the burner *g*, and supported by the plate *i*, is a bell-shaped conductor *m*, which guides the gaseous products of combustion to an earthenware tube *n*, in connection with the chimney. This tube *n*, may be surrounded, if thought desirable, by a casing, composed of angle iron and slips of glass or earthenware.

In order to generate heat by this stove, the air supply-pipe *e**, is opened, by turning the cock, shewn in fig. 2, and the gas is turned on and lighted. The damper of the pipe *d**, is then opened, and air is admitted into the compartment

d, whence it rises up the tubes *h*, which are subjected to the heat of the gas-burner; and the temperature of the air becoming thereby elevated, it passes out at the top of the stove and warms the apartment. It will now be understood that fresh air, of an elevated temperature, may be thrown into an apartment in any required quantity (such temperature being regulated by the quantity of air admitted into the tubes *h*,); and that without the possibility of the air being injuriously affected by admixture with gas or contact with heated metal. It will also be seen that, as provision is made for a complete command over the supply of air, just the amount that is required to support combustion may be admitted to the burner, and too great a draft up the chimney prevented.

At fig. 4, the improved cooking-stove is shewn in sectional elevation. The object in the use of this arrangement being to retain the heat within the casing, the patentee employs but one current of air, which is supplied, in the ordinary manner, to support the combustion of the gas. The casing is constructed as already explained with respect to the heating-stove. In this stove double doors are employed; the inner one of which is made of glass, to allow of the attendant inspecting the viands (to ascertain the progress of the cooking), and prevent the necessity for the frequent opening of the door; which, by permitting access of cold air, greatly retards the cooking operation: the second door is of earthenware, and is intended merely to prevent the radiation of heat The burner *o*, is situate (for the purpose of baking) in the lower part of the stove; and at the upper part of the oven a horizontal flue *p*, is made, the entrance to which is near the front of the stove. The design of this flue is to prevent the sudden escape, from the stove, of the heated gases, which, by being led along the top of the oven, render the heat thereof more equable, and also to check the action of any downward draft that may be set up in the chimney. Over the oven, but enclosed in an upper compartment or second chamber, is a burner *q*, suitable for boiling a kettle, heating a stewpan, &c.; and surrounding this burner is a coiled pipe *r*, the ends of which are connected, by union joints, to a boiler *s*, mounted on a bracket *t*, carried by the stove-frame. This pipe is intended to take up the waste heat from the burner *q*, and transmit it to water or other liquid contained in the boiler *s*. The heating of the water in the pipe *r*, will, as is well understood, cause the water contained in the boiler to flow into and through the pipe and re-enter the boiler, so long as the gas is kept burning. By this means water may be kept hot, when boiling or such

like operation is being performed, without the consumption of more gas than is required to effect that operation.

The patentee claims, First,—the general arrangement and construction of stove for heating apartments, as above described. Secondly,—supplying gas-stoves with two distinct currents of air, for the purposes above set forth, when such streams are capable of being regulated respectively to suit the requirements of the apartment to be warmed, and of the burner employed in the combustion of the gas. Thirdly,—constructing the panels of gas-stoves, as above explained. Fourthly,—with respect to cooking-stoves, the use of double doors,—the inner one being filled with slips of glass, for the purposes above set forth; and also the horizontal flue for equalizing the heat in the oven. Fifthly,—the application thereto of the coiled pipe, whereby the water or other fluid may be heated, in an adjacent boiler, by the waste heat of a gas-burner employed for another and a distinct purpose.

To WILLIAM BOLIVAR DAVIS, *of Southampton, for improvements in ships'-buoys, life-buoys, ships'-fenders, and other similar articles.*—[Sealed 1st October, 1852.]

THIS invention consists in making ships'-buoys, life-buoys, ships'-fenders, and other similar articles, of a wicker or cane framework; within which are enclosed cork shavings, water-tight air-vessels, and other similar buoyant materials, properly protected from the action of water. In constructing a life-buoy the patentee prepares a hollow framework of wicker, cane, or some other light and elastic or yielding material, and of any suitable form and dimensions; and inside this he places either air-vessels or cork shavings, or some other buoyant material, enclosed in bags to protect them from the action of the water. The light framework may, if required, be covered externally with painted canvas, or some other material.

The simplest form of life-buoy, constructed after this manner, is shewn in Plate XI., wherein fig. 1, is an external view of a life-buoy, made in a circular form; and fig. 2, is a section of an air-vessel contained therein. This vessel, by being placed inside the wicker-work, is not so liable to injury as if left unprotected by such a material. The wicker-work is covered over externally by waterproof cloth or canvas, or other impervious material, and is provided all round with cords; so that the life-buoy, when thrown into the water, may be

readily seized by the person immersed. Fig. 3, is a plan view of another form of life-buoy, constructed in a similar manner to the circular buoy shewn at fig. 1. This buoy is intended to be used as a canoe or life-boat, in which any person may venture into a rough sea or surf, for the purpose of saving the lives of others. To this end the life-buoy is provided with paddles or oars, for the purpose of propelling it through the water; and cords or ropes are also provided, to enable persons in the water to support themselves. The bottom of the buoy is open, and it is provided with two seats or straps, made of some flexible material, and on or within which the rower is to place himself.

A life-buoy, in the form of a belt, may be made of a number of lengths of bamboo or other cane, the ends of which are to be sealed up in any convenient and suitable manner; and the pieces, so prepared, should be arranged in a row, and enclosed in a canvas covering or case, long enough to fasten round the body of the wearer. In place of cane, hollow tubes of tin or papier-maché may be employed; or, if preferred, short tubes, made of gutta-percha or India-rubber, and properly secured at both ends, may be used; but, in all cases where economy of construction is required, cane is preferable, as being the cheapest article, and least liable to injury. The tubes or cane should be from 1 inch to 3½ inches in diameter.

Fig. 4, is a longitudinal vertical section of a life-belt, constructed in this manner. *a, a, a,* are the hollow tubes or pieces of cane, having their ends sealed up by waterproof cement, to exclude the water and render them buoyant. For this purpose, the bamboo cane, from being hollow, will be found the best; and these pieces of cane or short tubes are enclosed, and properly secured, between pieces of canvas, and covered over with some waterproof fabric *b, b.* The belt, so made, is provided with buckles and straps *c, c,* or other suitable fastenings, at each end, for securing the belt round the waist of the wearer. A supporting strap *d, d,* is also attached to the upper part of the belt, and, when passed round the wearer's neck, will prevent the belt from getting displaced.

Ships'-buoys, anchor-buoys, and ships'-fenders, may be made upon the principle already described. Fig. 5, represents a ship's-buoy or anchor-buoy, constructed of strong wicker-work, inside which are placed buoys, made of some waterproof material, and containing cork shavings, air-vessels, or some other buoyant substance. A strong wrought-iron rod passes through the buoy from end to end, and is provided at each extremity with strong iron rings or swivels, for the

attachment of ropes thereto. Fig. 6, is an external elevation of a ship's-fender, constructed in like manner, but further protected on the outside with lacing, or net-work, of strong cord or rope, as is usual with these articles.

The patentee claims constructing ships'-buoys, life-buoys, ships'-fenders, and other similar articles, of a framework composed of basket or wicker-work, inside which are placed air-vessels, cork-shavings, or other buoyant materials, which are thereby protected from injury. And also the use in the construction of life-belts, or swimming-belts, of short lengths of cane, or short tubes made of metal, papier-maché, India-rubber, gutta-percha, or other suitable material, secured between a canvas or other covering, and further protected by a waterproof outer covering, as shewn and described.

To William Simpson *and* John Shelton Isaac, *both of Maidstone, for an improved composition, to be used principally as a substitute for wood or other materials, where strength and lightness are required, in the manufacture of various articles.*—[Sealed 2nd October, 1852.]

The object of this invention is to manufacture boards or sheets, of great strength and lightness, for many purposes for which wood and veneers are now employed. The material employed for this purpose is either straw, hop-bine, or other similar vegetable fibres.

The first process to which the straw or other material is subjected, consists in cutting the straw or similar vegetable matter into short pieces, by a chaff-machine or other contrivance. The material, so cut up, is then submitted to the action of a boiling solution of hydrate of soda or potash, of from 7° to 10° Beaumé, in order to remove the silex and coloring matter. This boiling process is best effected by means of high-pressure steam, conveyed through a worm, in a small vessel placed underneath the tub or pan in which the straw or other vegetable matter is contained, and which small vessel is connected, by means of two pipes, with the tub or pan containing the straw or other vegetable matter; the one being the ingress, and the other the egress pipe; by which means a constant circulation of the solution of potash or soda is kept up. When the boiling process is completed, and the straw has been thoroughly washed, it is put into a common beating-engine, where it is reduced to the state of pulp. If it be desired to give the boards any particular color, coloring-

matter may be introduced into the vat or the engine, so as to dye or color the whole of the pulp. The coloring of the pulp may be effected either by means of dye-woods, such as logwood, camwood, or other vegetable substances containing coloring matter; or by the introduction of earths, such as ochres, umbers, and the like, according to the purpose, and to suit the color required. Or should it be considered desirable to bleach the pulp before any of the dyes are used, a solution of chloride of lime can be made use of in the engine. The pulp, thus prepared, is then run off into a chest, and from thence into a vat, as required. Moulds of any convenient size having been provided, a given quantity of the prepared pulp, according to the size and thickness of the sheet or board intended to be made, is then placed in the mould, and submitted to pressure, in order to express a considerable portion of the water, and give solidity to the board. A number of boards, so prepared, may then be couched, with one or more felts between each board; after which they must be submitted to a very heavy pressure, to free them of the remaining water, and prepare them for the drying process, which is best performed in a stove. After being dried, the boards are passed between glazing-rollers, to give them a smooth surface, and also to flatten them. They are then oiled and baked in the usual way, when they may be again pressed, and afterwards polished or japanned, and finished as may be required.

The patentees claim the manufacture of an improved composition (to be used as above set forth) from straw, hop-bine, and other similar vegetable fibres; and also coloring the same during the process of manufacture, by the application and use of dyeing or coloring matters to the pulp; whereby a more durable color will be obtained than if the composition were merely colored or painted on the surface.

To WILLIAM EDWARD NEWTON, *of the Office for Patents, 66, Chancery-lane, for improvements in stoppers for bottles and other similar vessels,—being a communication.*—[Sealed 2nd October, 1852.]

THIS invention relates to a novel method of constructing that kind of capsule or stopper which is usually made of metal and applied to the necks of bottles.

The improved stopper is composed of a metallic or other capsule, which is secured to the neck of the bottle or other vessel, and is furnished with a screw-plug which may be with-

drawn by unscrewing, so as to admit of access to the interior of the vessel, and may be replaced at pleasure and secured air-tight, as in the first instance. This plug may, if required, be furnished with a cork inside to fit the neck of the bottle, and should be provided with a washer, which, when screwed down on to the neck of the vessel, will keep the same air and water-tight.

In Plate XI., fig. 1, represents the neck of an ordinary wine bottle, with the improved capsule and stopper adapted thereto; and fig. 2, represents the same in section,—the screwed stopper being shewn detached from the capsule, or that part which is secured to the bottle. It will be seen that the aperture at the upper part of the capsule *a*, has an internal thread, for the purpose of receiving the male screw of the stopper *b*, which, in order to make an air-tight joint, is provided at its shoulder with a washer, made of leather, gutta-percha, or other smilar material. The inside of the stopper is made hollow, to receive a plug of cork or other suitable material, which, by entering the neck of the bottle, will prevent the liquid contained therein from coming in contact with the metal part of the stopper.

In place of making the male screw on the stopper and a female screw in the capsule, these parts may be reversed, so as to make the stopper embrace the top of the capsule. When such is the case, in place of employing a washer of leather or gutta-percha, as shewn, the washer must be placed on the capsule; or if the cork stopper be dispensed with, a disc of cork or other suitable material may be placed in the recess in the stopper *b*.

The patentee claims, constructing stoppers of bottles and other vessels of two parts,—one of which is secured, in any convenient manner, to the neck, mouth, or upper part of the bottle or other vessel, and the other part is applied and secured thereto by means of a screw, as shewn and described.

To ROBERT MORTIMER GLOVER, *of Newcastle-on-Tyne, M.D., and* JOHN CAIL, *of the same place, mathematical instrument maker, for improvements in miners' or safety lamps.*—[Sealed 6th October, 1852.]

THIS invention relates to a novel construction of miners' lamps, whereby the objections to which those lamps have hitherto been liable are removed. In the common Davy lamp the flame, as is well known, is removed from contact with the outer atmosphere by the employment of a wire-gauze covering

for the flame; but this gauze covering is open to the serious objection, that it obscures the light. To remedy this defect, it has been proposed to surround the flame with a glass cylinder; but the great damage that might result from the breakage of the glass, has hitherto rendered this suggestion useless.

In Plate XII, fig. 1, is a vertical section of the lamp, and fig. 2, is a sectional-plan view taken in the line 1, 2, of fig. 1. *a, a,* is the reservoir for holding the oil to supply the wick, which is inserted in the conical tube *b*. The wick may be raised, lowered, or otherwise operated upon, by the bent wire *c*, which passes through the bottom of the lamp. The oil reservoir is screwed into the bottom ring *d, d,* and held firmly therein by a screw *e*. *f, f,* is the upper ring of the lamp, connected to the lower ring *d*, by the vertical pins or standards *g, g*. An ordinary wire-gauze chimney *i, i,* with a moveable cover *j*, is secured in the upper ring *f*, in any convenient manner; and the lamp may be carried by a handle, chain, or cord, passed through the ring *k*, above. The air, to support combustion in the lamp, is made to pass through holes or openings made in the upper ring *f*, of the lamp; and after passing through the meshes of a ring of wire-gauze *i*, it descends through the annular passage formed between the two glass cylinders *m*, and *n*, which are supported from below, and rest upon a second ring of wire-gauze, which lies upon the projecting pieces *o, o, o,* of the lower ring *d*. The passage of the air from outside the lamp to the flame in the interior, is indicated by the arrows.

By this arrangement of parts it will be seen, that as the air to support the combustion of the flame must pass down the annular channel, between the two glass cylinders, that cylinder which is exposed to the external air must be kept cooler than when only one is employed; the danger of the cylinder becoming broken by any cold substance coming against it when in a heated state, is therefore avoided. In order to prevent any currents of air from rendering the flame unsteady, a conical metallic tube *p, p,* is placed inside the wire-gauze chamber, and immediately above the flame. Or the flame may be protected from the action of currents of air by means of a short pipe, placed outside and round the lower part of the wire-gauze chimney. It is preferred, however, to construct and adapt the tube as shewn in the drawings.

The patentees claim the general arrangement of the parts herein shewn, or any modification thereof, in which the air to support combustion is made to pass down two cylinders of

glass, which surround the flame. They likewise claim the combination of the glass cylinders with the wire-gauze rings, as shewn, and also the use or application of the conical or other metallic tube *p, p,* or its equivalent, for protecting the flame from the action of currents of air as above described.

To Anthony Liddell, *of Canterbury, engineer, for improvements in stuffing-boxes, and in packing to be employed with stuffing-boxes and pistons.*—[Sealed 20th October, 1852.]

This invention consists in adapting, in a peculiar manner, to the rubbing surfaces, a coil or strip of metal, which, in the case of stuffing-boxes for packing piston-rods, is inserted in a conical recess made in the stuffing-box, and held in its place by a filling of lead or other soft metal. In carrying out this invention, a band or strip of metal (by preference copper) is coiled helically round a rod or mandril of the size of the rod or other surface to be packed: the outer edges of this coil should be turned off or rounded, and then the metal coil may be placed on the rod or other surface, and inserted in its conical recess in the stuffing-box. Into the box, molten lead (or other metal which is fusible at a lower temperature than the metal of which the helical coil is composed) is then poured, for the purpose of filling up the box, and imbedding the coil in the molten metal. By this means, a solid and lasting packing is produced, which, as it wears away, may be contracted in diameter, by serewing down the gland.

In Plate XII., fig. I represents, in vertical section, the stuffing-box of a piston-rod, with the improved packing adapted thereto; *a, a,* is the outside casting of the stuffing-box; and *b, b,* is a cast-iron lining turned conically internally. For the convenience of inserting it in its place in the stuffing-box, this lining is divided into two parts. *c, c,* is a coil or strip of copper or other metal, which surrounds the piston-rod *a.* The inner side of the gland *e,* is turned out conically, and is provided with another copper coil *c*,* which also surrounds the piston-rod. The metal coil *c,* having been inserted in its place, the vacant space around the piston-rod is filled with molten lead or other soft metal *f.* As the metal coils *c,* and *c*,* wear away, the packing is tightened, by screwing down the gland *e,* which will compress the soft metal *f;* and by forcing down the metal coils *c,* and *c*,* against the inclined sides of the lining, will cause them to embrace the piston-rod.

Fig. 2, shews the method of applying the invention as a packing for pistons. *g*, is the solid part of the piston; *f*, the soft metal packing; *c*, the coiled strip of copper, which is turned out conically inside,—the outer or rubbing surface, in this instance, being cylindrical, or nearly so. *e*, *e*, is a cover, which is adapted to the piston in such a manner, that it may be screwed down thereon, so as to compress the soft metal, and cause it to force the metal coil *c*, into close contact with the sides of the cylinder. If thought desirable, the edges of the piston-cover *e*, may be turned so as to form the frustrum of a cone; by depressing which, the soft metal may be forced outwards against the cylinder, so as to form a perfectly steam or water-tight packing.

The patentee claims the use and application of the strip of coiled metal *c*, and *c**, and the soft metal *f*, for packing rubbing surfaces, as shewn and described,

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To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, for improvements in washing and amalgamating gold and other metals.*—[Sealed 15th October, 1852.]

This invention relates to a mode of subjecting pulverized ores to the combined action of water and quicksilver, for the purpose of amalgamating the metallic particles thereof with the quicksilver, and of driving off the earthy and other refuse matters.

In Plate XI., fig. 1, is a vertical section of the apparatus employed by the inventor for the purpose; and fig. 2, is a plan view, with the vertical water and feed-pipe and conical cap removed. A, is a circular vessel for containing mercury, and provided with a rising conical bottom. On the surface of this conical bottom numerous curved grooves C, C, are formed, through which the water and pulverized ore are passed into the quicksilver. These grooves are covered with a hollow cap D, screwed firmly down through its flange E, and having a hole F, in its top, to receive the feed-pipe G, which fits in tightly, and is high enough to contain a column of water sufficient to force its way, with the pulverized ore, through the said grooves and the quicksilver in the vessel A, and pass off through the discharge-spout H. The mercury vessel is provided with an outlet I, for discharging the amalgam as often as may be necessary.

The operation of the apparatus is as follows:—The pul-

verized ore is placed on a sieve at the top of the feed-pipe G, and a constant stream of water is applied thereto; whereby the fine golden or other metallic matter is washed through the meshes of the sieve, and down the pipe into the diffusing grooves C, C; the pipe being meanwhile filled to a height sufficient to countervail the resistance of the heavy body of quicksilver, and force the metallic matter through the grooves at the bottom of the vessel A, into the mass of quicksilver. By this means the metallic particles become thoroughly mixed with the quicksilver, and the water and other light matter, rising up to the edge of the mercury vessel, pass off through the discharge-spout H; while the gold or other metal is taken up by, and amalgamated with, the quicksilver. This amalgam is drawn off as often as it may be necessary, by removing the plug from the outlet-pipe I; and a fresh supply of mercury is then placed in the vessel A, ready for the next operation.

The patentee claims, First,—the forcing of pulverized golden or other metallic ore, in a diffused and agitated state, through a mass of quicksilver, by the pressure of a column of moving water, or other equivalent pressure; whereby the gold or other metal is extracted by amalgamation, and the water and other light matters rise to the surface, and pass off, substantially as described. And, Secondly,—the construction of apparatus, as described with reference to the drawing, for effecting the operation above set forth.

To JOHN KEALY, *of Oxford-street, agricultural implement maker, for improvements in machinery or apparatus for cutting or slicing roots.*—[Sealed 19th October, 1852.]

THIS invention relates, firstly, to an improvement on the knife, to be applied to turnip cutters, for which the patentee obtained protection under the Registration Act, on the 6th March, 1852; and, secondly, to a mode of applying such knives, or knives with a straight or continuous edge, so that the depth or thickness of the slices produced by their use may be regulated with great nicety and expedition.

In Plate XII., figs. 1, shew, in plan and edge views, the registered knife above alluded to;—it is formed from a strip of sheet steel, in the opposite edges of which slanting parallel cuts are made, of any suitable length and distance apart. One half of the metal lying between these cuts is then bent down at right angles; whereby the knife, when seen in plan view, is made to assume the appearance of a saw-edge; but in reality

right-angled cutting edges are formed at opposite edges of the strip of metal.

The first part of the invention consists in combining with one such line of cutters, a smooth cutting-edge, situate at the opposite edge of the plate of metal; so that, whereas the action of the one edge of the knife would be to make right-angled cuts, or cuts in two directions, that of the opposite edge would be to make cuts in one direction only. The mode of mounting these knives, so that they may cut up roots into pieces of various thicknesses, is shewn in plan view at fig. 2; and fig. 3, is a vertical section of the improved machine taken in the line 1, 2, of fig. 2. *a, a,* are the knives, affixed at their extremities by screws to the rings *b, b,* the arms of which are carried by the shaft *c.* This shaft turns in bearings in the main framing *d,* and it is provided with a winch handle *e,* to rotate it, and a fly-wheel *f,* to steady its motions. To the inner periphery of the rings *b, b,* curved plates *g, g,* are affixed by screws or other attachments, situate at points about midway of their length; and thus they serve to complete a kind of drum. Strength and rigidity is given to these plates by means of cross bars *h, h,* which pass from one ring to the other, and are attached thereto. These curved plates occupy the circumferential space between the knives; and to their edges, which approximate to the knives, cross bars *i, i,* are rivetted. Projecting laterally from the rings *b, b,* are flanges, through which screws *k,* pass,—and thence through the ends of the bars *i, i,* for the purpose of securing them to the rings. These bars are also furnished with screws *l, l,* which bear against the inner periphery of the rings *b, b,* for the purpose to be presently explained. The knives *a, a,* are secured to the rings in such a position, that the blades which make the vertical cut shall be nearly parallel with their line of motion, and the curved plates take a corresponding position. The drum is enveloped in a casing, the lower part of which, at *m,* is concentric with the drum, and is intended to support any pieces that may have been cut, but not so completely as to admit of their passing the knives and entering the drum. By being thus kept up within the circuit of the knives, these pieces will, at the next opportunity, be more completely acted upon. The upper part *n,* of the casing forms an expanding continuation of the hopper *o,* into which the roots to be cut are thrown. The end plates of the casing *n,* are each provided with two projections *p, q,* which are intended as stops to hold up the turnip, or other vegetable substance under operation, to the action of the knives.

Let it now be supposed that the machine is to be put into

action, and that it is driven in the direction of the arrow, fig. 3: To cut up turnips for cattle, it will be necessary to adjust that edge of the plates *g, g*, which is adjacent to the right angle cutting-edge of the knives, so that a depth of cutting-edge, equal to the depth or thickness of pieces required, shall be presented to the turnips under operation. This is effected by means of the screws *k*, and *l*; by turning which the edge of the plates is brought to and retained in any required position. The turnips being now fed into the machine, and rotary motion being given to the drum, the upper knife will bear against the turnips which lie in its course, and drive them against the stop *p*, where a portion will be sliced off, and simultaneously cut up into small pieces; which will pass into the drum, and be thence discharged through the lateral openings into any suitable receptacle. If, however, any pieces escape past the stop *p*, they may be intercepted in their passage downwards by the second stop *q*, and then again come under the action of the knife; but, if this should fail, they will be carried up by the knife into contact with a second stop *q*, on the other side of the machine, and there the cut will be completed. In order to bring into use the straight or continuous edge, which is intended for slicing food for sheep, the opposite edges of the plates *g, g*, are to be adjusted, as already explained, to suit the depth of cut required; and the drum is rotated in an opposite direction to that indicated by the arrow. When the knives, with two right-angled cutting-edges (as shewn at fig. 1,) are employed, the same contrivances are adopted, as above explained. Instead of giving the knives a rotary motion, they may receive a reciprocating axial motion, and so cut alternately with their opposite edges. In such case one knife will suffice for one machine; and if the knife carries two different gauges, that is, for cutting food for sheep and for cattle, two distinct receptacles should be provided for receiving the different sized pieces that fall from the machine.

The patentee claims, First,—the construction and use of a knife which combines, as already explained, a straight-edge, and right-angled cutting-edges, for the purpose above set forth. Secondly,—the general arrangement of the machine, as above described and shewn in the drawing. And, particularly, he claims determining the depth of cut to be made by the use of an adjustable gauge, set in front of the cutting-edges, and working in the manner above set forth.

To Edmund Morewood *and* George Rogers, *both of Enfield, for improvements in rolling metal.*—[Sealed 1st October, 1852.]

The patentees describe, as their invention, the using two or more pairs of rollers, in succession, for the extension or flattening of iron, zinc, lead, tin, copper, or the alloys or combinations of those metals, in order to get through more work and obtain the advantages of rolling and drawing combined; also to obtain flatter surfaces in sheets of metal than is obtained by the ordinary modes of extension.

In carrying out their invention, the patentees (for extending bars of iron to thinner forms, or into rods or wire) place in a frame two or more pairs of rollers, one behind the other, and drive each succeeding pair of rollers at a somewhat greater speed than the pair preceding them. When operating on tough metals, such as iron and copper, they prefer the speeds of the different pairs of rollers to be such that there shall be a strain on the iron and copper, so as to extend it, and assist in laying the fibres of the metal in one direction. The end of the bar, or other piece of metal, is introduced between the first or slowest pair of rollers; and, by their revolution, the metal is carried forward to the succeeding pair of rollers, which take hold of the metal, and, revolving at a greater speed than the first pair, cause an extension of the metal by drawing it out, and, at the same time, compressing it. When the metal, by being so treated, becomes light, they place a bed or guide-bar betwen the different pairs of rollers, so as to guide the metal from one pair of rollers to the other. In some instances, such as in the manufacture of wire, they can substitute a die for the first pair of rollers; but they consider the rollers preferable. When iron and copper are to be operated upon, it is preferred that those metals should be previously heated to a suitable temperature, for facilitating the working of those metals. By rolling out sheets of metal through successive pairs of rollers, as thus described, the necessity of an after cold rolling or flattening, which tends to harden the iron, is avoided; and by the combined action of several pairs of rollers, or combining the drawing and rolling, for the manufacture of wire, the metal may be extended at a more uniform temperature than by rolling with one pair of rollers: the advantage of drawing the fibres of the metal in one direction is said to be likewise obtained.

The patentees state, that although they have described this mode of proceeding, which combines the advantages of rolling

and drawing, they would have it understood that they do not confine their claim to it, but that the drawing may be dispensed with, and the use of the several pairs of rollers alone retained. The rollers must be made of the materials best suited for the work they have to perform,—in most cases iron will be found the best material for them. When the object is only to flatten the surface of the sheets of metal, much lighter rollers are used for the second pair than for the first; and they are worked under much less pressure than where the object is to extend the metal by drawing it out.

To James Hare, *of Birmingham, for improvements in expanding tables and music-stools.*—[Sealed 1st October, 1852.]

This invention relates, firstly, to the use of toothed racks, which are fixed to parts of a table, and are moved in opposite directions by right and left-handed screws, set in motion by a key or bar sliding within the axis of the screws; and, secondly, to the application to music stools of a long screw-nut, and a screw which works therein and carries the seat.

In Plate XII., fig. 1, shews the table-expanding apparatus complete; having a square bar sliding within the axis, which has a right and left-handed screw fixed to or formed thereon; such bar having one of the racks and plates combined with it, by which the apparatus is fixed to the parts of a table. Fig. 2, is a view looking underneath, shewing the apparatus fixed to parts of a dining table. In each of these figures the same letters are used to denote corresponding parts. *a*, is a square bar having a square end at a^1, on to which a moveable key may be placed to turn it. This bar *a*, turns in its plate *b*, which is fixed to part of the framing of the table. *d*, is a rack sliding in a groove formed in the frame *f*. In the teeth of this rack the screw *g*, at one end of the hollow spindle *c*, gears; by which means the rack is moved to or from the end frames e^1, f^1, of the table; the bar *a*, sliding into or out of the hollow spindle *c*, according as it is turned in one or other direction. The screw *h*, at the other end of the spindle *c*, gears into the teeth of a second rack *d**, which is fixed to a second plate *b**, and slides in a groove at *f**; and as the two screws *g*, and *h*, are right and left-handed, the two racks *d*, and *d**, will be moved in opposite directions, simultaneously, whether when contracting or expanding the table to which the apparatus is applied.

Figs. 3, and 4, shew the improved apparatus which forms the second part of the invention; fig. 3, being a sectional elevation of the apparatus, and fig. 4, a long screw-nut, with the collars top and bottom for guiding the spindle. *a*, is the spindle, having a plate and screw at its upper end, to which the seat is fixed. It will be found, that by means of the screw and plate, the seat will be rendered more firm than by the mode of fixing hitherto resorted to. On the spindle *a*, (fig. 3), a short screw a^1, is formed, by which the spindle is caused to rise and fall in the fixed nut *b*, according as the seat, which is carried by the spindle, is turned in one or other direction. *c*, *c*, are collars fixed at the two ends of the nut *b*, and this nut is inserted in the pedestal of the stool. By this arrangement it will readily be understood, that the spindle *a*, will be retained and guided in a vertical position by the collars *c*, *c*; and as they are at a considerable distance apart, an advantage is derived from this mode of constructing and combining the parts over the mode hitherto practised, wherein the male-screw on the spindle was a long time working into a short female-screw.

The patentee claims the combination, herein described, of mechanical parts applicable to expanding tables; and, secondly, he claims the combination of mechanical parts, as herein explained, applicable to music-stools.

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, for improvements in governors or regulators for regulating the pressure of gas as it passes from the main or other pipes to the burners,—being a communication.*—[Sealed 2nd October, 1852.]

This invention relates to a method of regulating or governing the pressure of gas at the burners, so that the gas may issue therefrom with a regular pressure, irrespective of the varying pressure in the main, and of the number of burners used. It is known, that the pressure of gas in the main changes considerably from various causes, and that this variation is increased in the branches by the varying quantity of gas consumed; and it is also known, that these variations are wasteful of gas.

According to the present invention, the varying pressure of the gas is balanced in the main, by connecting with the valve a disc, or balancing-surface, equal to the surface of the valve; so that whatever may be the variation of pressure in

the main, the valve will be in equipoise, so far as regards that pressure,—when this is combined with a mode of governing the size of the aperture through which the gas passes to the branch, by the pressure of the gas beyond the valve; so that when that pressure increases, the valve will be carried towards its seat to reduce the supply, and hence the pressure, and *vice versâ*; which latter mode of regulation is effected either by the pressure of the gas on the face, which would tend to close it, and acting against a weight, or its equivalent, which tends to open it, and which can be set or adjusted to any desired pressure; or by causing the gas in the branch to press on the surface of a disc, in addition to the valve, so as to present a larger surface to the pressure of the gas; the better to effect the regulation of the supply, and hence the pressure at the burners.

In Plate XII., fig. 1, represents an improved governor in sectional elevation; A, is a vessel connected at its lower end with the main, and at the upper end with the supply pipe. This vessel is connected with another vessel E, by a neck or passage C, so that the gas in the main shall have free access to the lower part of both vessels. About the middle of the vessel A, there is a stricture *g*, *g*, to which is fitted a valve-seat *a*; and to this is fitted a disc-valve *m*, provided with a central stem *n*, jointed to one arm of a lever *c*, which rocks on a fulcrum-pin, sustained in bracket-pieces *b*, *b*. The stem *n*, of the valve should be made of sufficient weight and length to keep the surface of the valve in a horizontal plane.

At the opposite end of the lever *c*, to that which carries the valve *m*, is jointed a rod *d*, which is kept in a vertical, or nearly vertical, position, by having its upper end *e*, of a reduced size, and fitted to slide in a recess or hole in the cap *f*, of the vessel E. To this rod is secured a disc B, with a rim which is plunged in mercury, or other suitable fluid, contained in an annular cup *i*, formed in the vessel E, by an inner rim *h*. The upper end of the rod *d*, is formed to receive weights *l*, which can be put on and taken off at pleasure, by unscrewing the cap *f*.

The gas in the main has free access to the under surface of the disc B, and of course to the under surface of the valve *m*; and these being hung to the opposite ends of the lever C, and presenting an equal surface, whatever may be the pressure of the gas in the main, it must be equipoised,—the pressure under the disc being precisely equal to the pressure under the valve.

The weights *l*, on the disc are regulated to keep the valve

open against any desired and determined pressure above the pressure of the atmosphere; so that whenever the gas in the branch—that is, the gas beyond the valve—exceeds that pressure, it will act on the upper surface, and force it down gradually; reducing the aperture for the passage of the gas, until the gas is reduced to the determined tension; and then the valve is again lifted by the preponderance of the weights *l*, on the disc.

Thus it will be seen, that whatever may be the varying pressure of the gas in the main, it never can affect the regulation; because it is balanced, and therefore leaves the valve to be governed in its position, to regulate the flow of gas from the main into the branch, by the pressure of gas in the branch; the degree of which pressure is determined by the weights. When the rim on the disc dips in mercury, or other suitable fluid (mercury being preferred), the valve *m*, rises, and forces this rim into the mercury; its weight on the lever is thereby reduced, and *vice versâ*. To compensate for this, the arm of the lever *c*, to which the valve *m*, is jointed, is bent up so that as the valve rises, and the rim of the disc is forced into the mercury, the valve-arm of the lever shortens, and loses its leverage in the same ratio that the disc loses its weight.

Fig. 2, represents, in vertical section, the improved apparatus above described, with an additional element. The vessel A, is connected with the main at *c*, and with the house branch at *b*, and is provided with a valve-seat *a*, which is fitted to a rim or stricture *l*, and secured in its place by the screw-cap *b*, which forms the connection with the branch. The valve *d*, is fitted to the valve-seat *a*, and provided with a central rod and weight *f*, by which it is jointed to the lever *g*, and by which it is kept in a horizontal position. The vessel E, communicates with the vessel A, below the valve by the neck C, and above the valve by a passage *m*. And this vessel E, is formed with two annular cups *p*, and *q*, to contain mercury, or other suitable fluid, and to receive two rims *r*, and *s*, on the disc B. The annular cups communicate with each other by lateral passages *t*, so as to keep the mercury in the two cups at the same level. The disc is connected with the lever *g*, by the vertical rod *i*, which is guided by playing in a hole in the cap *h*, as before described.

The surface of the disc within the inner rim *s*, and exposed to the pressure of the gas in the main, should be exactly equal to the surface of the valve exposed to the gas in the main, so as to balance this pressure, whatever it may be, and however much it may vary; and the surface of the disc between the

inner and outer rims *r*, and *s*, and presented to the pressure of the gas in the branch, should be made so large that the pressure of gas in the branch shall act upon this in addition to the upper surface of the valve,—for the greater the surface exposed to this pressure, the more sensitive will be the instrument. The rod of the disc must, as in the first example, be weighted, to suit the pressure of gas required in the branch. The pressure of the gas in the main being balanced on the valve and disc, it is evident that the valve will be kept open by the preponderance of the weight on the disc end of the lever, until the pressure of the gas in the branch exceeds the determined degree; and then it acts on the surface of the disc between the two rims, and on the top of the valve; and having a large surface to act upon, immediately begins to move the valve towards its seat,—thereby gradually reducing the aperture for the passage of the gas, until the proper tension is restored, and *vice versâ*.

The advantage which this arrangement has over the one first described, is, that by the addition of the element of presenting the disc to the pressure of the gas in the branch, as well as in the main, the pressure of gas in the main is neutralized, as in the first plan; but a much larger surface is presented for the pressure of the gas in the branch to act upon, to close the valve, whenever the pressure exceeds the degree to which the instrument is set. The instrument last described can be made as sensitive with a very small valve as the other with a very large valve; and therefore the latter plan is better adapted to dwelling-houses, and other localities supplying a very limited number of burners.

From the foregoing it will be seen, that the instrument once set to a given pressure, the gas will issue from the burners constantly at that pressure, without regard to the variation of the pressure in the main, or the number of burners in use. It will be obvious, that instead of making the two arms of the lever of equal lengths, and the surfaces of the valve and disc which are exposed to the pressure of the gas in the main, equal, this may be varied, and one arm made longer, by making the surfaces inversely of corresponding proportion.

The patentee claims balancing the varying pressure of the gas in the main by connecting with the valve a disc which receives pressure from the main to balance the pressure on the valve, substantially as described, in combination with the method of governing the aperture through which the gas passes to the branch, by the varying pressure of the gas beyond the

valve which governs the aperture, as described; so that when the pressure becomes too great, the aperture shall be reduced, and *vice versâ*. And he also claims, in combination with the above, making the disc so that it shall be also acted upon by the varying pressure in the branch, to assist in moving the valve to govern the aperture for the passage of the gas, substantially as specified; whereby the action of the instrument is rendered more sensitive and prompt as a governor.

To George Wilson, *of the City of York, for an improved manufacture of glass bottles and jars.*—[Sealed 20th November, 1852.]

The object of this invention is to simplify the operation of manufacturing glass bottles and jars with a screw or thread on or around their neck,—such screw being intended to receive a capsule or cover for closing the bottle or jar. This is effected by adapting to the ordinary metal moulds, in which bottles and jars are cast or moulded, a pair of dies, furnished with a counterpart of the screw or thread required to be produced upon the bottle or jar-neck; and, by this means, a screw or thread is formed on the necks of bottles or jars at one and the same operation.

In Plate XI., fig. 1, shews, in plan view, one arrangement of mould for carrying out this invention; fig. 2, is a longitudinal vertical section of the same; and fig. 3, is an end view thereof. To the ground-plate *a*, a cylinder or box *b*, is bolted,—its use being to hold the mould *c*, which is formed to suit the shape of the vessel required to be cast. Immediately over this mould a pair of dies *d*, *d*, is made to close, when the operation of casting is proceeding, and thereby form a continuation of the mould. These dies are carried by a pair of horizontal levers *e*, *e*, which are hinged together and work on a fulcrum-pin attached to a standard *f*. The forward ends of these levers are connected by cross-rods *g*, *g*, to a rocking-frame *h*,—the fulcrum-pins of which work in bearings *i*, *i*, attached to the bed-plate *a*. To the forward end of the rocking-frame a tread-plate *k*, is bolted, to admit of the ready depression of the forward end of the rocking-frame, by the foot of the workman; which movement of the rocking-frame will cause the levers *e*, *e*, through the instrumentality of the cross-rods *g*, *g*, to approach each other, and bring the dies *d*, together over the mould. An adjustable stop-pin *l*, is attached to the hinder or heavier end of the rocking-frame, to limit the motion of that frame.

In manufacturing glass bottles and jars, the workman first gathers a ball of glass upon the end of a hollow rod or blow-pipe, in the ordinary way; he then places the glass, while still red hot, in the mould—the dies *d*, *d*, which are to form the neck of the bottle being apart to admit of the insertion of the glass—and, by depressing the plate *k*, with his foot, causes the dies to close. He then blows into the ball of glass, and causes it to take the form of the mould. He next, by removing his foot from the plate *k*, allows the dies to open, and removes the now formed bottle or jar from the mould. The bottle or jar is then cut off or broken away from the surplus glass remaining on the rod, and the lip or brim finished in the usual manner by the workman. It will be thus understood, that by one operation of moulding or casting, bottles or jars may be formed with a screw or threaded neck; and that, instead of a complete screw, segments of screws may be, in like manner, produced on the necks of bottles and jars.

In place of using the construction of mould just described, for carrying out his improved manufacture, the patentee sometimes employs the kind of mould shewn in side elevation at fig. 4, and in sectional elevation at fig. 5. This mould is composed essentially of two parts *a*, and *b*, which are hinged together at bottom, and admit of the mould opening from end to end, to release the moulded vessel. To the upper end of these half moulds *a*, *b*, the dies *c*, *c*, for moulding the threaded neck of the vessels are bolted. When the gathered ball of heated glass is placed in the mould, the workman closes the mould in the usual way, and produces the glass vessel, as already explained. By using removable dies, the thread or screw of the mould may be readily renewed when worn. A further advantage consequent on their use is, that dies of different proportions may be applied to the same mould, and, consequently, that bottles or jars, of any given capacity, may be manufactured, with necks of varied proportions, to suit the different purposes for which they are required.

The patentee claims the manufacture of a screw-thread, or its equivalent, on the neck of glass bottles and jars, simultaneously with the casting or moulding of the body of such articles; and he further claims the use, in such manufacture, of removable dies, as above explained.

To Bernhard Harczyk, *of St. Mark-street, Tenter Ground, Goodman's Fields, for an improved preparation or composition of coloring matter, to be used in washing or bleaching linen and other washable fabrics, and in the manufacture of paper and other substances.*—[Sealed 1st October, 1852.]

The principal object of this invention is to supersede the use of the blue balls or stones employed by laundresses in washing linen, to impart a blueish tinge to the water, and by that means neutralize or destroy the yellow tinge which linen or cotton goods usually acquire from wear. One objection to the use of this "blue stone" is, that it does not dissolve in the water, but merely becomes mechanically mixed with it; and therefore, if water tinged with this blue is allowed to remain at rest for some time, a great portion of the coloring matter settles at the bottom of the vessel; and if any goods are left in the water, they will become spotted by this deposit, instead of being colored or tinged with blue in a uniform manner.

To obviate this objection, it is proposed to make, in the first place, a perfectly soluble preparation of indigo; and then coat with that solution sheets of paper, linen rags, or other substances capable of receiving the preparation. When any blue color is required to be used, for any of the purposes to which it may be applicable, it will only be necessary to put a piece of the prepared paper or fabric into the water, and this latter will instantly become tinged with a fine blue, which tint will remain in the solution, without deposition, for any reasonable length of time.

The coloring solution is prepared by dissolving indigo in very strong sulphuric acid; and after the indigo has been digested in the acid for a suitable length of time, the acid is neutralized by potash or other alkali.

The patentee has found, by experience, that the following process and proportions of ingredients will effect the desired object in a satisfactory manner.

To one pound, by weight, of pulverized indigo, which is placed in an earthen vessel, about three pounds of strong sulphuric acid are gradually added. The mass is well mixed, and kept stirred, in order to prevent it from boiling over; and when it has become smooth it is allowed to stand for from six to ten hours to digest: a solution of potash, of about the strength of 20° Beaumé, is then added, in about the proportion of 4 quarts of the solution of potash to every pound

of the sulphuric acid. These ingredients are placed in a vessel which will hold about 40 gallons, and the mixture is well stirred for a few minutes with a spatula, and then allowed to remain for from 10 to 14 hours; after which the vessel must be filled with water, and the contents again well stirred. After remaining quiescent for from 24 to 28 hours, the supernatant liquor must be run off, until it begins to run thick; when there will remain in the tub not more than about 12 inches deep of liquor: this may be again mixed or stirred, and poured into linen bags, which will hold about 2 quarts each. The bags must be hung up, to drain off the water; and when no more liquid appears to drop, the contents of the bags must be put in a shallow dish or vessel, and laid on the surface of paper or other suitable material, by means of a fine-haired brush. When the surface is dry, another coating may be put on; and when both sides of the paper or fabric are dry, it may be pressed, to flatten it, and then it will be ready for the market.

The coloring matter, thus prepared, is so innoxious, that it will not, in any way, deteriorate the finest linen, and it may even be drunk without danger; it may, therefore, be employed by sugar refiners to whiten their sugars, and is also applicable to the manufacture of paper when a fine light blue tinge is required. This coloring matter may also be employed as an ink, when reduced to the proper consistency.

The patentee remarks, that although he has mentioned potash as the alkali to be used to neutralize the acid, other alkalies, or alkaline earths, such as soda-ash, lime, or chalk, may be employed in place thereof, if thought desirable. He also observes, that although he has given as above certain proportions in which the ingredients are to be mixed, and also the length of time of the various stages of the process, yet he does not mean or intend to confine himself rigidly thereto. He claims the method, herein described, of preparing indigo for the various purposes for which it may be employed; and also particularly applying indigo or coloring matter to sheets of paper, or other suitable textile fabric, for the purposes above described.

To Arthur Jackson, *of Exchange-court, Liverpool, for improvements in gas-burners.*—[Sealed 1st October, 1852.]

This invention consists in applying a bent wire over the jet of a gas-burner, so as to be included in, and covered by, the

flame; by which means an increased illuminating power is said to be obtained.

In Plate XI., fig. 1, shews in side elevation, and fig. 2, in plan view, a gas-burner, having a wire applied thereto, according to this invention. This wire is inserted in the flame, and, by becoming heated, produces the increased effect above referred to.

The patentee claims the application of a wire to a gas-burner as herein described.

To Moses Poole, *of Serle-street, London, Gent., for improvements in harness and in horse and carriage furniture, —being a communication.*—[Sealed 1st October, 1852.]

This invention consists in applying to the manufacture of harness and carriage furniture a hard substance, produced from a compound of India-rubber and sulphur, with or without other matters, by subjecting the same to heat.

The patentee remarks, that in the specification of a patent granted to Mr. A. V. Newton (see Vol. XL., C. S., p. 9,) the hard material referred to was described as being used in combination with articles of metal in making parts of harness and carriages, such as saddle-trees, terrets, bits, stirrups, martingale-rings, and dasher-irons. Now this invention consists in employing this material in making articles where no metal is used, or where metal only is used as an accessory to the article so made;—the present invention being intended, as much as may be, to dispense with the use of metal and leather, when making those parts which have hitherto been made of metal, or metal and leather combined; and, in lieu thereof, to substitute the material above mentioned. For this purpose he makes saddle-trees and the exterior parts of harness, which have hitherto been made of leather, of the compounds above referred to, according to the article intended to be moulded or otherwise formed; and, when necessary to be lined, this may be done by sewing the parts through and through, as if leather were used; or, in shaping and forming the articles when made of sheets of the compound alone, he applies a strong fabric, and causes it to adhere to one surface of the compound before subjecting the parts of (for example) a saddle, harness, or horse or carriage furniture, to heat, in order that the fabric may become the means of fixing the padding or lining thereto; but, when making those parts which are substituted for thick leather, he

prefers using a material formed by uniting a number of thin fabrics together, made with coats of the compound between them.

The patentee remarks, in making the parts of harness and carriage furniture, that the compound may be made very tough and leather-like, by not subjecting the same to heat beyond 290° to 293° Fahr.; but when the compound is intended to be used as a substitute for iron or other metal, then the heat is to be raised from 295° to 305° Fahr.; but, if largely composed of foreign matters, the heat may be raised more quickly. In making rings, bridle-winkers, or harness ornaments, and other like articles of horse or carriage furniture, hitherto made of metal, the article is moulded, and then subjected to heat; or else it is made up roughly to nearly the desired form, and after being attached by heat, it is pressed in dies at a temperature of about 300° Fahr., by which means a very excellent finish is obtained. In applying heat to such articles it is desirable that it should be raised gradually, say, to 230° Fahr., in about half an hour,—retained at that heat for about one hour and a half, and then gradually raised to from 295 to 305° Fahr., for the remainder of six hours, unless there is much foreign matter in the compound; in which case the heat may be raised more quickly. When a more leather-like product is desired, the temperature should not materially exceed 293°. For making the strongest and hardest articles, it is preferred to use India-rubber and sulphur alone; but for those parts which have hitherto been made of leather, the patentee uses, instead of sulphur, such substances as gum-lac, gutta-percha, coal-tar, or pitch, (deprived of its water) white lead, and oxide of zinc. In some cases, a frame or parts of the article may be made of the hardest compound, or of iron covered with sheets of the material, and uniting the other parts thereto before applying the heat. In every case, the proportion between the India-rubber and sulphur, in the compound, should be at the rate of about two parts of India-rubber to one of sulphur (by weight);—such materials being well masticated or kneaded together.

The patentee claims the application, in the manner herein described, of India-rubber combined with sulphur, with or without other matters, in the manufacture of harness, aud horse and carriage furniture.

To Stephen Perry, *of Red Lion-square, for improvements in ink-stands or ink-holders.*—[Sealed 1st October, 1852.]

This invention consists, firstly, in constructing ink-stands, wherein the ink, by being subjected to a slight pressure, will be forced up into a raised cup or dipping-place.

In Plate XII., fig. 1, shews a section of a flexible ink-stand, which is preferred to be made of gutta-percha, but may be constructed of other analogous flexible material. *a,* is the gutta-percha ink-vessel, placed in a wooden or other stand *b,* which may be made of any desired device. *c,* is a dipping-cup and tube, which has a screw, formed at its lower end, working into a hollow screw *d,* having passages for the ink to flow through, and fitted to the bottom of the vessel. It will be seen that, by screwing down the tube *c,* the top and bottom of the vessel will be drawn towards each other, and the interior area of the vessel being thereby lessened, the ink will be caused to flow into the cup; and when that quantity has been used, if the tube *c,* be screwed back, the vessel will expand again and cause a quantity of air to pass down the tube into the upper part of the vessel *a,* and fill the vacuum created therein. By slightly contracting or expanding the vessel *a,* the ink will rise or fall, so long as there is a sufficient quantity of ink left in the vessel.

Fig. 2, shews, in section, another arrangement of ink-stand, slightly differing from the one above described, but having the same principle of construction. *a,* is the ink-vessel, made of gutta-percha or other material, provided the bottom or some other part be made sufficiently flexible. *b,* is the stand, and *c,* is the dipping-cup and tube. In this arrangement the bottom of the vessel is acted on by a lever *e,* which is pressed on by a screw *f.* Hence it will be seen, that by depressing the shorter end of the lever, the other end will raise the bottom of the vessel *a,* and cause the ink to flow into the dipping-cup. When the screw is reversed, the vessel will again expand, and a quantity of air will pass down the tube into the vessel *a,* and form a resistance for driving up the ink, when required, into the dipping-cup.

The second part of the invention consists in arranging the pumping apparatus, so as to fit fluid-tight within a stopper, in place of using screws, or other fastenings, as heretofore: by this arrangement it may be more readily removed for repair or otherwise, and another substituted. Fig. 3, shews, in section, this novel contrivance. *a,* is an ordinary ink-vessel; *c,* the tube and dipping-cup; *d,* is the opening for receiving

the stopper *e*, which is made to fit air-tight. The pumping apparatus, of the ordinary construction, is formed at the upper part of the stopper *e*, and consists of a disc of vulcanized India-rubber *f*, fixed at its edges, as is well understood, and deflected by a screw or otherwise. This pumping apparatus may be varied, so long as it is arranged in a stopper, in place of being fixed as heretofore.

The patentee claims, First,—combining a flexible, or partly flexible ink-vessel with a dipping-cup and tube passing from above towards the bottom. And, Secondly,—he claims the combining of pumping apparatus with a stopper of ink-vessels.

To William George Nixey, *of Moor-street, London, for improvements in tills and other receptacles for money.*—[Sealed 1st October, 1852.]

This invention has for its object the prevention of fraud and error in paying or receiving money over a counter, and consists in a revolving wheel or set of moving compartments, which are brought up, in succession, under an opening, to receive the money which is to be deposited in the till.

In Plate XII., fig. 1, is a plan, and fig. 2, a section, of the rotating apparatus, constructed according to the invention. The money is retained, for a time, in the several compartments into which it is first thrown; until, by a succession of receipts, or by successive movements of a lever, working the rotating apparatus, the bottom of the receiver comes opposite an opening in the cover of the till. Then, by reason of the bottom of the compartment being no longer upheld, the money in that compartment will fall into the till or other receptacle below.

The patentee remarks, that in the apparatus there are six compartments shewn, but this number may be varied. *a*, is the cover of the till, having an opening through it at *b*; *c*, is the exterior cylinder of the apparatus, which is covered at the top by a thick plate of glass *d*; by which means the money in the several compartments is impounded: there is an angular opening in the glass, corresponding in size to one of the compartments. At the side of the apparatus there is a slot or opening, through which a lever *e*, works; and, by being moved, causes the apparatus to rotate a distance equal to one of its compartments. The lever *e*, moves on the hollow axis *f*, of the receivers *g*. On the axis *f*, a ratchet-wheel *h*, is fixed, and motion is communicated to the axis by means

of a click or driver i, which is pressed up to the ratchet-wheel by a spring; and, in order to prevent the rotating apparatus from turning, except when the lever is moved, a spring j, is used. A vulcanized India-rubber spring k, which is connected to the lever e, passes round a pulley e^1, and is fixed to the apparatus at k^1; by which means the lever has, at all times, a tendency to return to its original position. The rotating apparatus g, having six compartments, and each compartment having its angular bottom g^1, these bottoms, except when they come opposite the opening into the till, will be supported on the plate l, through which there is an angular opening, corresponding, in size, with the openings in the till and glass cover. As the money, when deposited, falls into that compartment of the rotating receiver next beyond the compartment which has last come over the opening into the till, the several sums of money will not arrive at the till, or permanent receptacle, until the rotating apparatus has been caused to move through a succession of steps; and the money, during such time, will remain in sight under the glass cover.

The patentee does not confine himself to the details herein shewn and described; but what he claims is the combination of apparatus herein described.

Scientific Notices.

INSTITUTION OF CIVIL ENGINEERS.

April 26th, 1853.

The paper read was, "*Observations on salt water, and its application to the generation of steam,*"—by Mr. J. B. Huntington, Assoc. Inst. C.E.

The author commenced by noticing that the introduction of Steam Navigation disturbed the laws regulating the properties of steam boilers; the effects observed being—the increase of heat required to generate steam from salt water—the waste of fuel from the necessity of blowing off the brine frequently, in order to prevent incrustation, and the detrimental action of the fire upon the flues when they had become covered with deposit.

Various contrivances were enumerated for obviating these inconveniences,—such as blowing off periodically,—diminishing the density of the feed water, by using the condensed steam,—absorbing the heat of the brine, during its exit from the boiler,—and using correct instruments for ascertaining the density of the salt water.

Descriptions were then given of the principal inventions, and the ameliorations introduced into "salinometers," and for the prevention of incrustration, from 1830 to 1850; and, after describing very minutely the investigations entered into, for the purpose of drawing up the paper, the author observed, that the principle on which a good salinometer should depend, was to provide an easy means of determining the quantity of salt contained in water, at any temperature. Recourse being had to experiment, to ascertain the constituent parts of salt water,—the relation of the weight of salt to the specific gravity of a solution, —the boiling point of the solution,—the state, when under pressure,—and the law of expansion,—data were obtained, from which general principles could be clearly established for future guidance.

Analyses of sea water shewed that the specific gravity varied from 1·026 to 1·031: the water from inland seas being often more dense: the Dead Sea, for instance, had a specific gravity of 1·211; —1000 parts of sea water contained from 22 to 28 parts of muriate of soda, and from 8 to 13 parts of other salts, which were chiefly soluble at high temperatures, except the sulphate and carbonate of lime, which averaged together $\frac{4}{10}$ths of a part in every 1000 of sea water. Common salt containing from 94 to 96 parts of muriate of soda, and from 6 to 4 parts of other salts in 100 of dry salt.

Sea salt contained from 72 to 77 parts of muriate of soda, and from 18 to 13 parts of other salts in 100 of dry salt.

In the experiments from which the results of the paper were derived, a saturated solution of common salt had a specific gravity of 1·213, or 77° of the hydrometer; and 100 parts of pure water dissolved very nearly 40 parts of salt at 60°; whereas a saturated solution of sea salt had a specific gravity of 1·236, or 85° of the hydrometer, for the same weight (40 parts) dissolved in 100 of water. But these were not necessarily constant, because the constituent parts of sea salt varied—the greater the proportion of muriate of soda, the less was the specific gravity, for the same weight of salt in the solution.

When salt water was heated, the increase of temperature of the brine above that of pure water was entirely due to the salt; for the steam arising from both waters exhibited identical temperatures under similar pressures. Hence the loss arising from this source was measured, not by the density of the solution, but by the salt dissolved in a constant weight of water; for the water which was evaporated took away no more heat at one density than at another; therefore the loss must be due to the salt left behind. The capacity for heat, exhibited by brine, was greater than that of pure water, inasmuch, as at a density of 39° of the hydrometer, 110 tons of coal were required to perform the duty of 100 tons, with pure water.

In making such experiments the thermometers required much attention; first in their construction, then in the several correc-

tions for the barometer, and the expansions of glass and mercury,—which latter rendered them objectionable for testing the saltness, even if the mercury did not clog in the tube.

In the periodical blowing off of boilers there were at least three losses to be calculated:—1st, the loss by capacity for heat; 2nd, by the injection of the feed-water; and 3rd, by the blowing out and restoring the deficiency by the feed-water.

From calculations made upon two boilers of very different dimensions, with the feed and steam in each of different temperatures, it appeared that to blow out one sixth, at intervals varying from 6 hours to 10 hours, working from a density of 30° to 35°, was the most economical system, as the quantity of fuel required became greater on either side of that limit.

The following were among the general results arrived at by experiments:—

That the per-centage of salt in a solution was in direct proportion to its density.

That the time required to attain a given degree of concentration was directly as the departure from concentration of the original density, the capacity of the boiler, and the relative volume of steam; and inversely as the density of the feed-water, the capacity of the cylinder, and the velocity of motion.

That as regarded time it was preferable to employ a low pressure, as the time consumed in arriving at a given concentration was longer as the pressure was lower.

That in equal weights of salts, dissolved in equal weights of water, the more heterogeneous the salts the greater was the density they exhibited in solution.

That the excess of the boiling point of a solution above that of pure water was not proportioned to its density, but to the quantity of salt dissolved by a constant weight of water.

That the boiling point was effected by atmospheric changes, as indicated by the pressure of the steam, which balanced the barometric column.

That the depression of the freezing point of brine, below 32° Fahrenheit, was similarly proportioned.

That the excess of temperature of the water of any solution, above that of the steam generated from it, whether below or above atmospheric pressure, was constant for any solution, whatever might be the pressure and the temperature of the steam; the excess being in direct proportion to the quantity of salt dissolved by a constant weight of water.

That the expansion of any solution in excess of the expansion of pure water was in direct proportion to the salt dissolved by a constant weight of water.

That the water space of boilers should be small, and the feed-water as hot as possible, to save fuel.

That the density of the feed-water should be kept as low as possible.

That in constructing salinometers the quantity of salt left behind for every 100 parts of water evaporated should be registered; as upon that quantity depended the calculations of effect in fuel.

That hydrometer makers should not only engrave the temperature for which the instrument was fitted, and the scale of saltness, but also the specific gravity of the sea water on which the scale was formed, and the proportion the muriate of soda bore in 100 parts of dry sea salt, in order to be able to make the necessary corrections for the varying saltness of the sea. And,

That in order to prevent the deposit of sulphate and carbonate of lime, the degree of saltness should not exceed 25 parts for every 100 parts of water, or 60° of the hydrometer.

May 3rd, 1853.

The paper read was, "*A description of the Chesil Bank, (Portland,)*" by Mr. J. Coode, M. Inst. C.E.

The author, in his position of resident engineer of the "Portland Breakwater Works," now in course of execution under Mr. J. M. Rendel, President Inst. C.E., had for a long time directed his attention to the extraordinary accumulation of shingle, called the Chesil Bank,—one of the most remarkable features of the south-east coast of England.

It consisted of a vast mound of shingle, in the form of a narrow isthmus, lying upon the western sea-board of Dorsetshire, between Abbotsbury and Portland; its length was 10¾ miles, in a south-east direction, and its breadth at the base, or level of low water of ordinary spring tides was 170 yards, near Abbotsbury, and 200 yards at Portland. Along a portion of its course, south of Wyke, the bank acted as a natural breakwater to the anchorage of "Portland Roads," affording shelter from the westerly and south-west gales. The height increased from the north-west, but the inclination of the crest was not uniform throughout; the rise between Abbotsbury and Wyke being at the rate of 1 in 8450, whilst that between Wyke and Portland was 1 in 880.

In a transverse direction one general slope appeared to exist, from the summit down to a depth of 3½ to 4½ fathoms below low water; the rate of inclination varying only from 1 in 5½ to 1 in 7. In the next depth of 2 fathoms, the slope was 1 in 8 to 1 in 11;—outside this, the slope was about 1 in 30, to a depth varying from 6 to 8 fathoms, at which point the shingle ceased entirely, and was succeeded by fine sand.

It had been generally supposed that the nucleus of the bank was formed of a mound of clay; repeated trials by boring had however shewn that the bed on which the shingle rested, on the east, was the edge of the Kimmeridge Clay of the east bay; and

it was only on that side that it could be reached by boring tools. The bank consisted in reality of shingle, mixed in places with sand, and so compact as to prevent the percolation of water, except during heavy gales from the south-west; notwithstanding that at certain times the tide rose nearly 3 feet higher on the west than on the east side of the bank, and in heavy gales the waves ran up the slope as much as 10 feet, vertically.

The largest shingle was generally found "to leeward," or farthest from the point whence the heaviest seas proceeded; and so clearly was this defined, that a Portland fisherman was popularly said to be able to distinguish, in the darkest night, any precise spot of the beach "by the size of the pebbles."

The shingle composing the bank consisted chiefly of chalk flints, with a small admixture of pebbles from other formations, and, in an interesting geological examination of the coast, the author traced the principal supply of shingle to have been derived from the chalk cliffs to the westward, between Lyme and Sidmouth, and from the vicinity of Beer Head. Other shingle, of distinct character, proceeded from Budleigh Salterton; and other pebbles from Aylesbere Hill, inland, being brought down to the coast by the river Otter.

The question was next discussed as to the power by which shingle was conveyed from a distance of between 40 and 50 miles, and deposited in the form of a high mound. The action of tidal currents was carefully examined, and after admitting that they did sometimes modify the extent and form of accumulations of shingle, and referring to the late Mr. H. R. Palmer's paper "On the Motion of Shingle Beaches," additional reasons were given against the sufficiency of this tidal action to produce such results. Instances were then cited of shingle travelling in opposition to the prevailing current of tide; and having shewn that the progress of the shingle could not be attributed to the action of the tidal currents, the effect of the wind waves was attentively considered. The prevalence of west and south-west winds on that coast was demonstrated, from the observations made at Plymouth with Whewell and Osler's anemometers, by Sir W. Snow Harris, for the British Association, and it was shewn, that lines drawn across the bay, in the direction of the heaviest and prevailing winds, would intersect the points whence the shingle had evidently been derived; it was shewn also, that the seas driving along the west side of Portland sufficed to arrest the progress of the shingle; and the evidence adduced led irresistibly to the conclusion, that the ultimate movement of shingle was always found to be in the direction of, and never against, the drift of the heaviest seas, but frequently in opposition to the prevailing tidal current.

It appeared evident that neither the action of the stream at Abbotsbury nor the flow of the tide in the fleet could have moved the mass, or piled up the mound of shingle composing the bank.

The sudden depth of 8 fathoms of water at a cable's length from the shore was a peculiar feature, and permitted the heaviest seas to fall in with great violence, and without the retardation and loss of force usually experienced on long shelving beaches.

Evidence was then adduced that shingle was moved at a much greater depth than was usually supposed: the author, in his researches, found that at one time the pebbles down to the edge of the sand were incrusted with barnacles, "balanus balanoides," and subsequently, after a continuance of heavy gales from the south-west, the shingle down to the lowest point, was found to be completely freed from incrustration; demonstrating that there had been considerable motion of the pebbles at a depth of 8 fathoms below low water of spring tides.

The formation of the gullies or "cans," in the face of the bank, caused by the partial percolation, was then noticed, as tending in some degree to produce the flat slope on the east side.

The author considered the cause of the largest shingle being found to "leeward" was, that large pebbles were more easily moved than those of small size, inasmuch as the former were generally of exceptional dimensions, were usually found on the surface, and offered nearly the whole of their surface to the action of the waves; whereas the latter, forming the bulk of the mass, were more uniform in size, were closely embedded together, and exposed little more than their upper surfaces, over which the waves had a tendency to travel, rather than to lift them from their bed. Thus the larger stones were rolled about by every wave, whilst the small pebbles were only moved in a mass, and received their abrasion whilst settling down again to form the even uniform surface of the beach.

After a heavy gale and a ground swell, the large shingle was entirely scoured away. The small shingle was thrown up to the crest or top of the bank, during the height of heavy gales, out of the reach of ordinary waves, or the clawing action of receding water.

By sections of the profile of the bank, taken after a heavy gale from the south-west, at right angles to the direction of the bank, the general form was shewn to be nearly that of a true parabola, with the axis inclined to a level line to the extent of 1 foot in 90 feet.

Mr. Palmer's views as to the "accumulative" and the "destructive" action of waves, were then examined,—the author's observations inducing him to fix other limits: the rule, so far as one could be formed, being in his opinion, that seven, or any less number of waves per minute, induced the "destructive" action; and nine, or any greater number, in the same time, the "accumulative" action; it being admitted that shingle always accumulated with off-shore winds, and was scoured off during on-shore winds, and especially by the subsequent ground swell; bearing in mind, however, in watching the course of the crest of the wave,

after breaking, that if it fell upon the water of the preceding wave, then returning down the slope of the beach, (as was the case when waves followed in quick succession,) the "accumulative" action was going on; but if the water descended directly on the pebbles, (as when the waves broke at longer intervals,) the "destructive" action was progressing.

The rapidity with which the water ran off or was absorbed, would influence the result, and that was to some extent contingent on the slope of the beach, and also on the nature and degree of compactness of the material of which it was composed.

The paper concluded with some instances of the effects produced on the Chesil Bank by heavy gales from the south-west, and it was stated that on such occasions it was not an uncommon occurrence (when the advancing wave met the receding water of the wave immediately preceding it,) to see an enormous mass of broken water and spray rise vertically to the height of 60 or 70 feet. This force had on several occasions crushed inwards the decks of vessels stranded on the beach.

During the gale of the 27th December, 1852, the quantity of shingle scoured away between Abbotsbury and Portland, was 3,763,300 tons; and the quantity thrown in within the next eighteen days was 2,671,500 tons.

On the 23rd November, 1852, a heavy ground swell, consequent on half a gale of only four hours' duration from the south-west, scoured away within eighteen hours 4,553,000 tons; and in five days afterwards, 3,554,200 tons of shingle were found to have been thrown in again. These quantities were derived from careful admeasurement of the profile of the bank.

The paper was illustrated by a large series of diagrams, of the sectional profiles of the bank, and the outlines of the shores, exhibiting the geological features of the coast, with the bearings of the prevalent winds, &c., together with a collection of specimens of the shingle, taken at four different points along the bank, and at various levels, from the top down to a depth of 8 fathoms below low water of spring tides.

May 10th, 1853.

The evening was devoted to the discussion of Mr. Coode's paper, "*Description of the Chesil Bank (Portland).*"

After passing deservedly high encomiums upon the paper, it was remarked, that however acute and scientific the observations might be on this particular locality, it would not be prudent to receive the conclusions as applicable to beaches in general, under all circumstances,—in fact, it would be safer not to generalize upon this or any other isolated case.

As to the position of the large shingle:—on any shelving shores, where the waves could only act upon the beach at or about

the time of high water, the larger pebbles were found near the top, after the occurrence of storms; because, under such circumstances only, did the waves exert sufficient power to break heavily upon the beach; under light winds the force of the waves was expended in the shoal water before reaching the beach.

Instances were given of the motion of shingle as affecting the entrances of harbours, which was the main practical point to be considered by civil engineers. At Lowestoft, just as much sand was washed up as supplied that which was required for ballasting the vessels frequenting the port. At Sunderland, the cross action of the waves, influenced by the ledge of rocks outside the new harbour, caused a deposit of shingle on the opposite sides of the groins.

The work of Lamblardie on the motion of shingle (Mémoire sur les Côtes de la Haute Normandie) was referred to as corroborating the views of the author of the paper on the motion of "beach" by the wind-waves, and giving valuable facts, bearing on the subject.

Viewing the relative position of the geological strata of the coast to the westward of Portland it was considered probable that the extent of chalk exposed to the action of the waves had, at a former period, been much greater than at present; that the disintegration of the underlying green sand had expedited the fall of the chalk and flints, and thus supplied the material for forming the bank.

The travel of pebbles was gradual, and distinctly up and down the beach, having an onward tendency in the upward motion, and yielding to the force of the then existing wind-wave. At an angle of about 45°, the greatest amount of travel or onward movement was observed; but the size of the shingle, more especially, was determined by the amount of undulation.

So much interest had been excited by this paper and by the valuable facts laid before the meeting, (and it was evidently within the power of so many engineers to transmit the results of their observations on the shores adjoining the works under their charge,) that an appeal was made from the Chair for their attention to so evident a mode of benefitting the institution, whilst the best interests of science would be advanced.

May 17th, 1853.

The first paper read was "*On the caloric engine,*" by Mr. C. Manby, M. Inst. C. E. (Secretary).

At meetings of the "Société d'Encouragement pour l'Industrie Nationale," on the 26th January, 1852, and of the "Académie des Sciences," on the 2nd February of the same year, Mons. Galy-Cazalat entered upon an examination of the principles of Ericsson's caloric engine, assuming it to be composed of parts analogous to a non-condensing steam-engine.

After describing these component parts, and their several uses and relative bearings, he gave the following quotation from Ericsson's English Patent of December 26th, 1850. "The invention consists in producing motive power by the application of caloric to atmospheric air, or other permanent gases or fluids, susceptible of considerable expansion, by the increase of temperature,—the mode of applying the caloric being such, that after having caused the expansion, or dilitation which produces the motive power, the caloric is transferred to certain metallic substances, and again re-transferred from these substances to the acting medium at certain intervals, or at each successive stroke of the motive engine; the principal supply of caloric being thereby rendered independent of combustion, or consumption of fuel accordingly, whilst in the steam-engine, the caloric is constantly wasted by being passed into the condenser, or by being carried off into the atmosphere.

"In the improved engine, the caloric is employed over and over again; enabling me to dispense with the employment of combustibles, excepting for the purpose of restoring the heat lost by the expansion of the acting medium, and that lost by radiation also, for the purpose of making good the small deficiency unavoidable in the transfer of the caloric."

These passages would have led to the idea of a perpetual motion, but that the well-known law governing the elastic force of gases at various temperatures, demonstrated the erroneous principle on which the presumed economy of the caloric engine was based. It was contended, that if the degree of elastic force of a gas was directly proportioned to the amount of caloric combined with it, a certain mechanical power must be exerted to abstract that caloric from the gas, and no filter could retain any portion without opposing such a degree of resistance as would destroy the economy.

Arguing upon the generally-received dimensions of Ericsson's engine, it was demonstrated, that in order to arrive even at a less amount of economy of fuel than had been claimed for the machine, it was requisite that the air leaving the cylinder should traverse the meshes of the metallic web in the "regenerator" without cooling by expansion; or in other words, preserving the elastic force of two atmospheres, primarily possessed by it, in the working cylinder. But this force, being reduced to the sum of the resistances of the atmosphere and of the "regenerator," the sensible heat was reduced by the amount employed in expanding the air, without being usefully transmitted to the metallic web. The result was, that the escaping air carried off almost all its latent heat, expanding into nearly twice its previous volume; the insignificant portion of sensible heat imparted to the metallic web being proportioned to the weight and bulk of the metal, and corresponding with the diminution of the volume of air.

It was argued also, that in practice the caloric engine would be more simple and economical if the "regenerator" were sup-

pressed, and a greater extent of heating surface were given to the air vessels; as the surface was now so small that two-thirds of the fuel were uselessly consumed; and therefore that any present apparent economy could only be made on one-third of the fuel effectively employed.

In calculating the economy of fuel by the use of the "regenerator," the following formulæ were employed.

To find the mean temperature of the "regenerator," before and after the passage of the air:—

$$t'' = \frac{tP+T\,(C+P)}{C+2P}$$

$$t' = \frac{TP+t\,(C+P)}{C+2P}$$

In which

P, represents the ratio of the weight of the copper to that of the air;

C, the ratio of the specific heat of air to that of copper;

T, temperature of hot air;

t, " cold air;

t'', the mean temperature of the "regenerator" after the passage of the hot air;

t', the mean temperature of the "regenerator" after the passage of the cold air.

The result was, that 245° Fahr. of heat were carried by the air at each stroke into the atmosphere.

Quotations were given from a letter addressed by M. Regnault to Colonel Sabine, Treas. Royal Society (dated April, 1853), in which he stated, that he was about to publish, immediately, a series of elaborate experimental researches on various subjects connected with the effects of heat on elastic fluids, the results of which would solve many questions long in dispute, and by means of which engineers might accurately calculate the effect of a given amount of fuel, in whatever way it was applied. M. Regnault communicated, in anticipation, that he had arrived at the number 0·237 for the specific heat of air at constant pressure, and at 0·475 for that of steam under atmospheric elasticity,—the specific heat of water being taken in each case as unity.

The next paper read was "*On the principle of the caloric or hot air engine,*" by Mr. J. Leslie, M. Inst. C.E.

The main objects of the author were to shew that the "regenerator," or as he contended it should be called, the "economizer," was based on the correct principle of the rapid equalization of temperature of two bodies of unequal temperatures when brought into contact, and that it was practically productive of economy of fuel; that the date of the production of Stirling's air engine was antecedent to that of Ericsson; and that the former was

decidedly superior to the latter in the general arrangement, in the details of construction, and in general efficiency.

If it was admitted that the wire-gauze or thin plates did absorb the heat in the passage of the air in one direction, and give it out again on its return—it was contended at some length that there must be economy of heat, unless the mechanical power required to drive the air through and between the metallic webs in the "regenerator" was greater than the advantage to be derived from the alternate heating and cooling. It was contended that the required force was, in reality, very insignificant,—that it did not increase in proportion as the density of the air was augmented, and that by the removal of the "regenerator" the air-engine would lose its power and its economy. That Stirling's air-engine, at Dundee, did act efficiently for some years, and was only at last abandoned from the difficulty of preventing the bottoms of the air vessels from being destroyed by the direct action of the fire.

The apparatus called "Jeffrey's respirator" was instanced as an analogous application of the alternate heating and cooling of air in its passage between the metallic surfaces.

It was contended that to Dr. Stirling was due the merit of the invention of the economizing process on which the air-engine was based, whilst to his brother, Mr. James Stirling (M. Inst. C.E.), must be conceded the practical reduction of the bulk of the engine by using compressed air; the latter improvement having been patented in 1827, and with other ameliorations in 1840;—that Stirling's engine was more compact than Ericsson's, and occupied less space, owing to the use of air compressed to seven or ten atmospheres, which increased the power of the machine directly in the ratio of the density of the air; and that in Stirling's engine, the working cylinder being a separate apparatus, connected only with the cool end of the air vessels, it never became heated to such an extent as to occasion the difficulty of lubricating, which had proved so prejudicial in Ericsson's and other engines.

The last paper read was "*On the conversion of heat into mechanical effect,*" by Mr. C. W. Siemens.

In the first section of the paper the abandonment of the prevailing theory, that heat was material (though imponderable), was insisted upon, and it was shewn to be untenable by Sir Humphrey Davy's experiment of melting two pieces of ice, by friction, against each other; by the experiment of Dulong, proving that although heat was absorbed in the expansion of gases, the specific heat of the gas was not thereby increased; and by the experiment of Joule, of Manchester,—who produced heat in several ways by mechanical effort only.

The "dynamical theory" was supported by proofs derived from French, German, and English authors of the present day.

It was explained that, according to that theory, heat was vibratory motion of the material particles of either solid, liquid, or gaseous substances. In the gases this motion was so great, that it completely destroyed cohesion between the particles; on which account they were better adapted to the production of mechanical effects by heat than either liquids or solids.

The elastic pressure of a gas was explained to arise from the impact of the vibrating particles against the sides of the containing vessel.

If the side yielded to the pressure, as was the case with a working piston, then the rebound of the particles would be less than their impact, and their length of vibration would diminish in proportion to the onward motion, or the mechanical effect produced.

The length of the vibrations determined the temperature, and their frequency the specific heat of a body. The product of the two multiplied by the weight, constituted the *vis viva*, or latent mechanical force, and might be numerically expressed, if the specific heat of the substance were accurately known.

It was argued, that the same heat must always yield, in its conversion, the same mechanical effect, no matter what the nature of the material employed might be. In illustration, a formula was given, which expressed the H. P. of any steam or air-engine by the temperature lost in the working cylinder, which formula was recommended for practical use, instead of the more complicated and uncertain method usually employed for ascertaining the force of expansive engines.

The total power to be derived from an expansive steam-engine was illustrated by a diagram, from which it appeared that the full theoretical equivalent for the heat employed might be obtained theoretically, though not practically, provided the steam was admitted into the cylinder at the pressure of about 18,000 lbs. per inch, or of equal density with the water producing it, and was allowed to expand to at least 18,000 times its original bulk below the working piston. Its temperature would, during this expansion, fall from 1200° to 100° Fahr., and it was shewn that each degree yielded an equal share of power. The specific heat of steam was shewn to be much greater than was generally supposed; and the supposition lately advanced by Rankine and Clausius, "that steam partially condensed in expanding," was held to be erroneous in consequence, and was certainly not corroborated by the form of actual indicator diagrams which were exhibited.

In the second part of the paper, the practical and theoretical conditions of air-engines were examined, and were illustrated by diagrams.

The result arrived at in this examination—of the general case of an air-engine, consisting of an air-pump, a heated reservoir, and a working cylinder, into which the heated air was admitted for such a portion of the stroke as to obtain the maximum expan-

sive action,—was, that "theoretically, it was not superior, and practically, it was much inferior, to an ordinary condensing steam-engine." There was, however, this important difference between the two classes of machines, that the unproductive portion of the heat required by the steam-engine was expended in the boiler, effecting increase of bulk without displacement of piston, whilst in the air-engine it presented itself at the exhausted port in its free (sensible) state, and might be usefully employed in partially heating the fresh supply of compressed air to the cylinder.

The air-engine by Stirling, of Dundee, was next investigated at considerable length, and it was shewn, that although its distinguishing feature, the "respirator" (or "regenerator,"), was, both theoretically and practically, an efficient means of recovering the unproductive heat of an air-engine, the advantage was lost in the great back pressure against the working piston, and in the air which remained in the displacing cylinders.

Ericsson's new engine was next examined, and was shewn to be the primitive air-engine, with the addition of Stirling's "respirator" (or "regenerator,"), and it was argued, that while (theoretically) it was somewhat superior, it must (practically) be considered as much inferior to Stirling's engine; in consequence of the heated working cylinder, the low working pressure, which was shewn not to exceed 1½ lbs. average pressure upon the up-and-down stroke of the working piston, and the utter inadequacy of heating surface, which was limited to the bottom area of the working cylinder, and the passage leading to the "regenerator."

The latter defect applied also to Stirling's engine, and was accounted for by apparent misapprehension of the principle involved.

The duty to be obtained by the different engines, expressed in pounds lifted 1 foot high, for the unit of heat, or heat required to raise the temperature of 1 lb. of water through 1° Fahr., was shewn thus:—

	Theoretical.		Actual.	In lbs: of Coal per H. P.
1. A theoretically perfect engine	770	about	350......	0·66
2. The Boulton and Watt condensing engine...	51·8	by rule	29......	8·00
3. The best Cornish engine	158	Pambour	82......	2·38
4. The expansive air engine	91	about	45......	5·15
5. Stirling's ditto	167	"	71......	3·26
6. Ericsson's ditto	196	"	60......	3·86

In conclusion, the author referred to his own experiments and practical experience of several years, and enumerated the necessary characteristics of a machine, which, in his opinion, would constitute the most perfect engine, and with different applications of the "respirator" (or "regenerator").

The paper read was "*A description of the Newark Dyke Bridge, on the Great Northern Railway,*" by Mr. J. Cubitt, M. Inst. C.E.

This bridge, for carrying the railway across a navigable branch of the River Trent, near Newark, was described as being erected at a point where the line and the navigation intersect each other, at so acute an angle that, although the clear space measured at right angles between the abutments, was only 97 feet 6 inches, the actual span of the girders was 240 feet 6 inches.

The structure consisted of two separate platforms, one for each line of rails, carried upon two pairs of Warren's trussed girders; each composed of a top tube strut of cast-iron, opposing horizontal resistance to compression, and a bottom tie, of wrought-iron links, exerting tensile force; these were connected vertically, by alternate diagonal struts and ties of cast and wrought-iron respectively, dividing the length into a series of fourteen equilateral triangles, whose sides were 18 feet 6 inches long.

The top tubes rested upon the apices of equilateral or A frames, fixed on the abutments, and each pair of girders were connected by a horizontal bracing, at the top and bottom, leaving a clear width of 13 feet for the passage of the trains.

Each tube was composed of twenty-nine cast-iron pipes, of $1\frac{1}{2}$-inch metal and $13\frac{1}{2}$ inches diameter at the abutment ends, increasing to 18 inches diameter with $2\frac{5}{8}$ inches metal at the centre of the span,—the ends of the pipes being accurately turned and fitted, so as to give exact contact of the surfaces, where they were connected together by bolts and nuts.

The lower tie consisted of wrought-iron links 8 feet 6 inches long, of the uniform width of 9 inches, but varying in number and thickness, according to the tensile strain to which each portion was subjected; the abutment portions having each four links of 9 inches by 1 inch, and the centre piece fourteen links of 9 inches by $\frac{7}{8}$ inch.

The diagonal tie links varied from 9 inches by $\frac{15}{16}$ inch to 9 inches by $\frac{3}{4}$ inch, and, in order to accord with the relative strains, were distributed in groups of four, for the first three lengths, on each side of the centre.

The cast-iron diagonal struts had a section resembling a Maltese cross; the area being in proportion to the compressive force to which they were subject.

The bearing pins at all the intersections were $5\frac{1}{8}$ inches diameter, carefully turned and fitting into bored holes.

The links of the lower tie were supported, in the middle of each length, by a pair of wrought-iron rods, $1\frac{1}{8}$ inch diameter, suspended from each side of a joint pin traversing the top tube; and by means of nuts and washers they could be made to bear a portion of the weight of the platform of the bridge.

The trusses were so arranged, that all the compressive strains were received by the cast-iron, and all the tensile force was exerted

by the wrought-iron; the proportions being such, that when the bridge was loaded with a weight equal to one ton per foot run, which considerably exceeded that of a train entirely composed of the heaviest locomotive engines used on the Great Northern Railway, no strain could exceed 5 tons per square inch of section.

The total weight of metal in each pair of girders, composing the bridge, was 244 tons 10 cwt., of which 138 tons 5 cwt. were cast-iron and 106 tons 5 cwt. wrought-iron; which with 50 tons for the platform, &c. made the total weight of each bridge 294 tons 10 cwt., or 589 tons for the whole structure; and the cost, exclusive of the masonry of the abutments, and of the permanent rails, but including the staging for fixing and putting together and the expense of testing, was £11,003.

In a series of experiments to test the stability of a pair of the trussed girders, at the works of Messrs. Fox, Henderson, & Co., where they where constructed, the following results were obtained:—

With a weight of 446 tons regularly distributed, which was equal to 1½ ton per foot run, plus the weight of the platform, rails, &c., lowered seriatim on the thirteen compartments, the ultimate deflection in the centre was nearly 6¾ inches.

With a weight of 316 tons, equal to 1 ton per foot run, plus the weight of the platform, &c., as before, the ultimate deflection at the centre was 4½ inches.

When the bridge was fixed in its place, a train of waggons, loaded up to 1 ton per foot run, extending the whole length of the platform, caused a centre deflection of 2¾ inches.

The deflection caused by two heavy goods engines, travelling fast, and slowly, was 2¼ inches; and that produced by a train of five of the heaviest locomotive engines used on the Great Northern Railway, was 2½ inches in the centre.

The proportions of the several parts of the structure were originally given by Mr. C. H. Wild (Assoc. Inst. C. E.), and had been only slightly modified by the author during the execution of the work.

LIST OF GRANTS OF PROVISIONAL PROTECTION.

[*Cases in which a full Specification has been deposited.*]

961. Juan Duran, of Madrid, for obtaining and applying motive power.—[*Dated April 21st.*]

999. Archibald Slate, of Woodside Iron Works, near Dudley, for an improved filter for water and other liquids.—[*Dated April 26th.*]

1009. Samuel Plimsoll, of Fullwood, Upper Hallam, Sheffield, for more thoroughly and effectually cleansing, extracting, and separating or fining ale, beer, porter, bitter beer, India pale ale, and other malt liquors from the yeast, bottoms, barm,

sediment, and other extraneous matters and impurities with which it may be in combination.—[*Dated April 27th.*]

1102. Charles Larbaud, of Paris, for a new system of trigger applied to play-arms, such as pistols, fusils, rifles, cannons, and guns.—[*Dated May 5th*]

1111. William Buckwell, of Ardmore Lodge, Wellington-road, St. John's Wood, for improvements in the construction of buildings.—[*Dated May 5th.*]

1213. George Berry, of Buttesland-street, Shoreditch, for an improved method of roasting coffee, cocoa, and chicory.—[*Dated May 17th.*]

[*Cases in which a Provisional Specification has been deposited.*]

468. Charles Flude, of Surrey Canal Bridge, Old Kent-road, for improvements in the production of spirit, and in the stills and apparatus employed therein.—[*Dated February 24th.*]

635. John O'Leary, of Liverpool, for improvements in chests for the use of emigrants, whereby they are also made applicable to other purposes.

637. John Henry Johnson, of Lincoln's-inn-fields, for improvements in the application of porcelain and similar materials to ornamenting purposes,—being a communication.

The above bear date March 14th.

672. George Rock Lucas, of Dronfield, near Sheffield, for improvements in the method of raising water and other materials from mines.—[*Dated March 18th.*]

778. John Smedley, of Lea Mills, Matlock, for improvements in machinery or apparatus for opening, cleaning, blowing, or scutching animal wool, cotton, or other fibrous substances or materials.—[*Dated April 1st.*]

809. William Wilcocks Sleigh, of London, for the production of motive power, which he entitles the counteracting reaction motive power engine.

811. Edmond Stanley Stanley, of Sloane-street, for an improvement in the manufacture of soda-ash or carbonate of soda from common salt,—being a communication.

813. John O'Connor, of Glentworth-street, Limerick, for the manufacture of coke from raw peat.

The above bear date April 5th.

845. William Ford Smith, of Manchester, for an improvement in certain vessels or utensils for heating liquids.—[*Dated April 8th.*]

885.—Alexander Edward Dudley Knox Archer, of Wharf-road, City-road, for improvements in apparatus for applying metallic capsules.

887. George Elliot and William Russell, both of St. Helen's, Lancashire, for improvements in the manufacture of alkali.

889. Thomas Edwards, of Birmingham, for improvements in steam-engines.
891. Douglas Hebson, of Dale-street, Liverpool, for improvements in working the air-pumps of steam-engines.
893. William Renwick Bowditch, clerk, of Saint Andrew's, Wakefield, York, for improvements in purifying water.
895. Charles Clifford, of Inner Temple-lane, for improvements in apparatus for lowering boats evenly and preventing them filling with water.

The above bear date April 13th.

896. John Hinks and George Wells, of Birmingham, for an improvement or improvements in certain kinds of boxes.
897. Thomas Lovell Preston, of Birmingham, for an improvement or improvements in cutting out and piercing metals.
899. Constant Jouffroy Duméry, of Paris, for improvements in the manufacture of paste and enamel buttons.
900. Charles Lowe, of Sheepy Hall, Leicester, for improvements in mills for grinding wheat and other grain.
901. John Chadwick, of Manchester, and Thomas Dickins, of Spring Vale Works, near Middleton, Lancashire, for improvements in the production of raw and thrown silk.
902. John Bethell, of Parliament-street, for improvements in the manufacture of flax.
903. William Laycock, of Birkenhead, for improvements in the manufacture of metallic and other casks and vessels.
904. Joseph Adamson, of Leeds, for improvements in flushing apparatus and in water-closets.
906. John Wallace Duncan, of Grove-end-road, St. John's Wood, for certain new combinations of gutta-percha with other materials, and the method of applying such for use.
907. Alfred Guy, of Upper Rosoman-street, for an improved filter.
908. Charles Green and James Newman, of Birmingham, for improvements in the manufacture of wheels.
909. Robert Wyburn, of Taunton, for improvements in the construction of easy chairs.
910. William Ogden, of Oldham, for a certain improvement or improvements applicable to carding-engines, used for carding cotton, wool, and other fibrous materials.
911. William John Thomas Jones, of Palace-street, Pimlico, for improvements in steam-engine governors.
912. David Zenner, of Newcastle-upon-Tyne, for improvements in the treatment of ores and other substances containing metals, to obtain products therefrom, and the apparatus used therein.
913. Alexander Crichton, of Saint George's-terrace, Park-road, Liverpool, for improvements in the fitting of bilge-pumps and injection-cocks of iron steamers and sailing vessels.
914. François Marie Antoine Serruys, of Bruxelles, for improvements in tanning,—being a communication.

915. Jean Baptiste Maniquet, of Paris, for certain improvements in machinery or apparatus for winding, cleaning, doubling, twisting, and spinning silk, cotton, wool, flax, hemp, and other filamentous materials.

916. George Titterton, of Margaret-street, Cavendish-square, for improvements in brushes.

The above bear date April 14*th.*

917. William Wilkinson, of Nottingham, for an improvement or improvements in ropes, cords, lines, twines, and mill-bandings.

918. William Allen, of Westbourne-street, Pimlico, and William Murrell, of Grosvenor-road, Pimlico, for improvements in the mode or modes of cleansing bottles or other similar articles.

919. John Lewthwaite, of Halifax, for improvements in rollers or mountings for blinds, maps, and other like articles.

920. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in treating refuse silk waste, and in converting it into a valuable product,—being a communication.

The above bear date April 15*th.*

921. Phillip Davis, of Whitechapel-road, for an improved mode of constructing the breasting to the revolving drums or beaters of threshing-machines.

922. Samuel Bayliss, of Old Broad-street, for improvements in consuming or preventing smoke and heating liquids.

924. Jean Marie Souchon, of Paris, for improvements in the manufacture and purification of gas for illumination, and certain products therefrom, and in apparatus for that purpose.

925. Joseph Cooke and William Cooke, both of Birmingham, for a new or improved machinery for cutting or shaping corks and bungs.

926. George Albemarle Cator, of Selby, Yorkshire, for improvements in machinery for preparing flax, hemp, and other vegetable fibrous substances, for scutching, or other manufacturing processes.

927. Isaac Simpson, of Preston, Lancashire, for improvements in machinery for covering wire, silk, cotton, linen, wool, or any other flexible material, with wire, plate, silk, cotton, linen, wool, or any other flexible material.

928. Henry Wilks, of Rotherham, for improvements in cocks.

The above bear date April 16*th.*

930. James Begbie, of Haddington, East Lothian, for improvements in the construction of wheel-carriages.

931. Richard Ford Sturges, of Birmingham, for a new or improved apparatus for making vegetable and other infusions and solutions.

932. Joel Watts, of Dover-cottage, Sleaford-street, Battersea-fields, for improvements in the construction of pistons of steam

and other engines; applicable also to force-pumps and lifting-pumps.

933 William M'Naughton, of Aberdeen, for improvements in printing yarns or worsteds for weaving carpets; also in printing carpets, woollen, silk, cotton, and other textile fabrics or fibrous substances.

935. William Fawcett and Francis Best Fawcett, of Kidderminster, for certain improvements in the manufacture of carpets.

936. James Salter Scarlett, of Norwood, and William Smallcombe Passmore, of St. Anne's-road, Brixton, for the application of a certain mineral to lamps in lieu of cotton or other wicks.

937. Jean Jules Gonin, of Paris, for improvements in disengaging silk of its gum.

The above bear date April 18*th.*

938. François George Sicardo, of Marseilles, for a new rotary steam-engine.

939. Thomas Newey, of Garbett-street, Birmingham, for improvements in fastenings for articles of dress.

941. Lambert Adolph Beauvain, of Upper Charlotte-street, Fitzroy-square, for improvements in machinery for obtaining wool, silk, and fibres from fabrics, and rendering them suitable to be again employed.

942. John Chatterton, of Birmingham, for improvements in coating tubes.

944. John Fuller, of Thomas-place, Kennington, for improvements in galvanic batteries.

945. Christian Böhringer and Gustavus Clemm, of Wohlgelen, near Mannheim, for improvements in the manufacture of soda and potash.

946. Thomas Day, of Birmingham, for a certain improvement in the manufacture of boots and shoes, whereby great ease is secured to the wearer.

947. Edward Vivian, of Torquay, for improvements in cases for containing hats in churches and similar situations.

948. Edward Vivian, of Torquay, for improvements in thermometers.

949. Andrew Blair, of Maryhill, Lanark, for improvements in propelling vessels.

The above bear date April 19*th.*

950. John Smethurst, of Manchester, for an improved plan for packing yarn and other materials.

951. Samuel Weight, of Cheltenham, for improvements in ventilating mines, sewers, or drains, ships, buildings generally, and other localities.

952. Emile Chappuis fils, of St. Mary Axe, for an improved apparatus for the diffusion of light, to be called the "myriastratic reflector."

953. Henry Mc Evoy, of Birmingham, for certain improvements in the construction and manufacture of door bolts.
954. Thomas Cooke Foster, of the Strand, for an improved reaping machine.
955. Richard Archibald Brooman, of Fleet-street, London, for improvements in inhaling tubes,—being a communication.
956. Richard Archibald Brooman, of Fleet-street, for improvements in reaping and gathering machinery,—a communication.
957. Sir William Snow Harris, of Plymouth, for improvements in lightning conductors for ships and vessels.

The above bear date April 20th.

958. Anthony Deale, of William-street, Hampstead-road, for ocean floats, which are designed to save lives and light treasures from shipwreck.
960. Charles Reeves, jun., of Birmingham, for an improvement or improvements in swords.
962. Henry Carr, of East Retford, Nottingham, for certain improvements in the construction of railways.
963. James Petrie, of Rochdale, for certain improvements in steam-engines.
964. Philip Harris, of Chatham, for certain improvements in fire-arms.
965. William Robjohn, of Islington, London, for an improved meter for measuring and indicating the measure of liquids.
966. William H. Johnson, of Granville, Hampden, Massachusetts, for sewing cloth, leather, and other materials.
967. William Edward Newton, of the Office for Patents, 66, Chancery-lane, for improvements in machinery for bending wood or other materials,—being a communication.

The above bear date April 21st.

968. Thomas Freeman Finch, of Worcester, for improvements in buttons.
969. James Davis, of Hemel Hempstead, for improvements in the manufacture of thrashing machines.
970. William Sager, of Seacombe, for certain improvements in machinery or apparatus for propelling vessels.
971. William Hunter, of Glasgow, for improvements in cutting and planing wood and other substances.
972. William Asquith and Joseph Asquith, both of Bagley Mills Leeds, for cleansing, preening, and removing wool flocks, waste, and refuse fuom the cards, teazles, cylinder, raising gig, and machinery used in the dressing of woollen cloths.
973. William Beard, of Cannon-street, London, for improvements in needles, and in the manufacture of the same.
974. Cyprien Marie Tessie du Motay, of Paris, for improvements in preparing oils, and in apparatus for burning the same.

975. Jerome André Drieu, of Bowden, Cheshire, for improvements for cutting the pile of velvet, velveteens, and other piled fabrics.

The above bear date April 22nd.

976. Edward Onslow Aston and George Germaine, both of Millwall, for improvements in compositions for coating wood, metal, and other materials exposed to the action of sea water or the weather.
977. Frederick Tompkins, of Manchester, for improvements in the mode or method of embossing and finishing woven fabrics, and in the machinery or apparatus employed therein.
978. Thomas Knowles, of Newton, Lancashire, for improvements in the machinery or apparatus for picking warps.
979. Frederick John Wilson, of Cadogan-place, Chelsea, for an improved wheel-barrow.
982. James Geddes, of Glasgow, for improvements in oars.
983. William Johnson, of Lincoln's-inn-fields, for improvements in machinery for combing wool or other fibrous materials,—being a communication.
984. James Napier, of Partick, Lanark, for improvements in separating certain metals from their ores and alloys, and for obtaining certain products therefrom.
985. George Fergusson Wilson, of Belmont, Vauxhall, William Henry Hatcher, of Mann-street, Old Kent-road, and John Jackson, of Southville, Wandsworth-road, for improvements in apparatus for manufacturing moulded candles.
986. Richard Johnson, of Manchester, for improvements in machinery or apparatus for drawing wire.

The above bear date April 23rd.

987. Edward O'Connell, of Bury, Lancashire, for improvements in the mode or method of feeding infants and invalids, and in apparatus connected therewith.
988. Henry Elliot Hoole, of Sheffield, for a self-acting speed regulator and safety break for railway carriages.
989. Charles Léon Desbordes, of Paris, for improvements in instruments for measuring the pressure and temperature of air, steam, and other fluids.
990. John Chatterton, of Birmingham, for an improvement or improvements in covers for wagons, carts, and other vehicles.
991. Robert Davies, of Allisson-street, Birmingham, for an agricultural reaping machine.
992. William Tillie and John Henderson, both of Glasgow, for improvements in printing shirting fabrics.
993. James Emery, of Preston, Lancashire, for improvements in the construction of gigs, dog-carts, and other vehicles.
994. William Johnson, of Lincoln's-inn-fields, for improvements in the means of retarding and stopping railway trains,—being a communication.

995. Julian Bernard, of Guildford-street, for improvements in casting metals, and in moulding or forming other materials.

The above bear date April 25th.

996. Isaac Brentnall Sheath, of Birmingham, for certain improvements in fire-arms.

997. Jacques Emile Joffriaud, of Paris, for certain improvements in machinery or apparatus for washing earths containing gold, extracted from the bottoms of rivers or other waters.

998. George Kennedy Geyelin, of Camden Town, for improvements in the manufacture of white oxide of zinc.

1001. John Pym, of Pimlico, for improvements in building materials.

1002. Auguste and Jean Le Roy and Eugène Pavy, all of Paris, for improvements in the production of lace and other fabrics.

1003. Uriah Scott, of Grove-street, Camden Town, for improvements in the manufacture of tubular rods and rings for furniture.

1004. Moses Poole, of the Avenue-road, Regent's-park, for improvements in the manufacture of porcelain and like wares,—being a communication.

The above bear date April 26th.

1005. William Johnson, of Farnworth, near Bolton-le-Moors, for improvements in machinery for preparing and spinning cotton and other fibrous substances.

1006. Frederick George Underhay, of Well-street, Gray's-inn-road, for improvements in reaping and mowing machines.

1007. George Ferdinand de Fonveille, of Marseilles, for a filtering machine, which acts under water, and is applicable to the filtering of all liquids.

1008. Benoist Marie Adolphe Langlois, of Rue du Faubourg Poissonière, Paris, for improvements in instruments to be applied to the chimneys of gas burners,—being partly a communication.

1010. John Hetherington, of Manchester, and John Dugdale the younger, and Edward Dugdale, both of Blackburn, for improvements in constructing and applying models or patterns for moulding, preparatory to casting iron, brass, and other metals, for various purposes.

1012. Richard Howson, of Manchester, for certain improvements in weavers' harness,—being a communication.

1013. John Henry Johnson, of Lincoln's-inn-fields, for improvements in apparatus for sustaining bodies in the water,—being a communication.

1014. Joseph Walter Gale, of Woburn-place, Russell-square, for improvements in the permanent way of railways.

1015. William Johnson, of Lincoln's-inn-fields, for improvements in machinery or apparatus for marking, ruling, or ornamenting surfaces,—being a communication.

1016. George Turner, of Bradley-terrace, Wandsworth-road, and Robert Holloway, of St. James-street, Old Kent-road, for improvements in the manufacture of unfermented bread, which improvements are also applicable to other purposes as a substitute for yeast.

1017. George Critchley, of Cheltenham, for an improved apparatus for regulating the heat and supply of water in hot-water apparatus.

1018. Joseph Palin, of Liverpool, and Robert William Sievier, of Upper Holloway, for improvements in distillation, and in apparatus connected therewith; which apparatus is also applicable to other purposes in which substances are to be treated by the assistance of a vacuum.

1019. Samuel Groves, of Great Marlborough-street, for improvements in pneumatic apparatus for pumping or forcing air.

1020. James Andrew Bruce, of Coleraine, for certain improvements in the construction of hay-racks, and other apparatus or apparatuses to contain fodder for horses and other cattle, and also in the method or methods of fastening horses or other cattle, to prevent their overcasting.

1021. Thomas Culpin, of Greenwich, for improvements in steam-boilers, and in the appendages thereto.

1022. Wellington Williams, of Gutter-lane, London, for a new combination of materials suitable for the manufacture of boxes, cases, trays, and other like articles.

1023. William Reid, of University-street, for improvements in apparatus for testing the insulation of electric telegraph wires.

1024. Richard Jordan Gatling, of Indianopolis, United States of America, for distributing power to machine shops, factories, and other places.

1025. John Filmore Kingston, of Carrol County, Maryland, for improvements in galvanic or voltaic batteries.

1026. William Frederick Thomas, of Porchester-terrace, Bayswater, for improvements in apparatus for sewing or stitching.

1027. Alfred George Anderson and John Barker Anderson, both of Great Suffolk-street, Southwark, for improvements in the treatment of certain saponaceous compounds obtained in the manufacture of soap.

The above bear date April 27th.

1028. Joseph Hetherington, of Manchester, for certain improvements in reels for reeling or winding yarns.

1030. Edward Bird, of Birmingham, for an improvement or improvements in the construction of certain kinds of vehicles.

1031. James Berry, of Horwich, near Bolton, and Thomas Booth, of Chorley, for improvements in machinery or apparatus for printing or staining woven fabrics and paper.

1032. Peter Fairbairn, of Leeds, and Ferdinand Kaselowsky, of Berlin, for improvements in machinery for drawing, roving, and spinning flax, hemp, and other fibrous substances.

1033. William Hurt Sitwell, of Sydenham, for improvements in projectiles for cannon and fire-arms.
1034. Sir John Scott Lillie, of South-street, Finsbury, for improvements in roads, floors, footways, and other like surfaces.
1035. William Armand Gilbee, of South-street, for improvements in apparatus for heating,—being a communication.
1036. Thomas Revis, of Stockwell, for improved single seed drilling or dibbling machinery.

The above bear date April 28th.

1037. George Thomas Day, of Burghfield-hill, Berkshire, for improvements in travelling packages.
1038. Thomas Pennell, of Birmingham, for improvements in the construction of revolving or repeating fire-arms, and in loading the same.
1039. Charles Auguste Joubert, Léon Jacques Tricas, and Jules César Kohler, all of Paris, for improved busks for stays.
1040. Robert Davison, of Mark-lane, London, and James Scott Horrocks, of Heaton Norris, for certain improvements in the means of conveying and distributing, or separating, granular and other substances.
1041. Thomas Collins Banfield, of Queen-square, Westminster, for machinery for cutting or chopping roots, plants, or other similar substances,—being a communication.
1042. Thomas Collins Banfield, of Queen-square, Westminster, for drying and preserving vegetable or other saccharine plants, —being a communication.
1043. Jacques Stanislas Vigoureux, of Reims, for certain improvements in the combing of wool and other fibrous materials.
1044. James Macpherson, of Manchester, for certain improvements in looms for weaving.
1045. Colin Mather, of Salford, for improvements in apparatus used in bleaching.
1046. Henry Witthaff, of Sidney-street, Oxford-road, Manchester, for improvements in filters,—being a communication.
1047. Oliver P. Drake, of Massachusetts, United States of America, for a new or improved apparatus for vaporizing benzole, or other suitable volatile hydro-carbon, and mixing it with atmospheric air, so that the mixture may be burnt for the purposes of illumination or otherwise.
1048. John Kealy, of Oxford-street, for improvements in machinery for mowing.
1049. James Bristow, of Bouverie-street, London, and Henry Attwood, of Holland-street, Blackfriars-road, for improvements in the means of consuming smoke.

The above bear date April 29th.

1050. Charles Adams, of Lillington-street, Westminster, for a new arrangement of valves for the supply of water to and from cisterns and other receptacles, and for a new float-valve.

1051. Barnabas Barrett, of Ipswich, for improvements in the treatment of natural and artificial stone, and of articles composed of porous cements or plaster, for the purpose of hardening and coloring the same.

1052. John Smith, of Albert-terrace, Aston, for an improvement in machines for cutting chaff, straw, gorse, and other similar substances.

1053. Weston Grimshaw, of Mosley, county Antrim, Ireland, for certain improvements in slubbing and roving-frames for preparing for spinning cotton, flax, and other fibrous substances.

The above bear date April 30th.

1054. John Balmforth, William Balmforth, and Thomas Balmforth, all of Clayton, Lancashire, for improvements in steam-hammers.

1055. John Smith, of Albert-terrace, Aston, for an improved flooring cramp and lifting jack.

1057. Henry Constantine Jennings, of Great Tower-street, for improvements in the manufacture of soap.

1058. John Filmore Kingston, of Carrol, Maryland, for improvements in reaping and mowing machinery.

1059. Edwin Heywood, of Glusburn, near Keighley, for improvements in apparatus for actuating and regulating the throttle-valves of steam-engines.

1060. James Reeves, of Bridgewater-gardens, Barbican, for improved machinery for forging, stamping, crushing, or otherwise treating metals, ores, and other similar materials.

1061. George Murton, of Eagley Mills, near Bolton, and William Hatton Langshaw, of the same place, for certain improvements in stretching, dressing, and finishing cotton and linen yarns or threads, and in the machinery or apparatus connected therewith.

1062. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in the extraction and manufacture of sugar, and of saccharine matters,—being a communication.

1063. Daniel Reading, of Chambers-street, Minories, for improvements in bearings for axles, and in axle-boxes and bushes.

1064. François Monfrant, of Paris, for improvements in lubricating materials,—being a communication.

1065. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in sawing-machines for slitting or re-sawing plank and other timber, by means of circular saws,—being a communication.

1066. Ambroise Maurice Christophe Claude Faure, of La Plaine (Hautes Alpes), France, for certain improvements in the manufacture of geographic and other maps.

1067. Christian Radunsky, of Cockspur-street, for certain improvements in electro-voltaic apparatus,—a communication.

1068. Mark Newton, of Tottenham, for certain improvements in

the construction of carriages, and in the means of preventing the overturning of the same when horses take fright,—being a communication.

1069. Joseph Thomas Wood, of Holywell-street, for improvements in the manufacture of boxes, such as have been hitherto made of pasteboard.

1070. Honoré Mane, of Arundel-street, Strand, for improvements in steam-engines.

The above bear date May 2nd.

1071. Thomas Claridge, of Bilston, for new or improved machinery for cutting or shearing metals.

1072. George Thomas Holmes, of Norwich, for improvements in threshing-machines, and apparatus connected therewith, for shaking the straw, riddling, winnowing, and dressing the corn.

1073. Robert Walter Swinburne, of South Shields, for improvements in the manufacture of glass.

1074. George Frederic Goble, of Fish-street-hill, for improvements in locks.

1075. Richard Quin, of Rodney-street, Pentonville, for improvements in the manufacture of cases for jewellery, for optical and other instruments, miniatures, and other articles.

1076. Severin Virgile Bonneterre, of Paris, for certain improvements in machinery for manufacturing screws.

1077. Edward Thomas Bainbridge, of St. Paul's Church-yard, for improvements in obtaining motive power.

1078. Louis Cornides, of Trafalgar-square, for improvements in treating certain ores and minerals for the purpose of obtaining products therefrom.

1079. Thomas Chambers and John Chambers, of the Thorncliffe Iron Works, near Sheffield, for certain improvements in kitchen sinks.

1080. Frederick Arnold, of Park-road, Barnsbury, for certain improvements in binding or covering books.

1081. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in hot air furnaces for heating buildings; some of which improvements are applicable to other furnaces,—being a communication.

1082. Frederic Lipscombe, of the Strand, for improvements in propelling vessels.

1083. William Edward Newton, of the Office for Patents, Chancery-lane, for improved machinery or apparatus for dressing mill-stones,—being a communication.

The above bear date May 3rd.

1084. George Bell, of Inchmichael, Perth, for a new machine for several agricultural purposes.

1085. Edward Walmsley, of Heaton Norris, for improved modes of preventing accidents arising from an insufficient supply of water in steam-boilers.

1087. Charles Videgrain, of Paris, for certain improvements in the treatment and preparation of certain natural or artificial stones, to render them applicable to various useful and ornamental purposes.

1088. Jean Brando Giannetti, of Paris, for applying the ascensional force of balloons to various useful purposes.

1089. Thomas Masters, of Oxford-street, for improvements in apparatus for freezing, cooling, and churning.

1090. John Houseman Hutchinson, of Grantham, for improvements in ventilating bricks.

1091. Edmund Jury Ockenden, the elder, and Edmund Jury Ockenden, the younger, both of Brighton, for improvements in valves and stop-cocks.

1092. James Edgar Cook, of Greenock, for an improved composition for coating and preventing the decay of exposed surfaces.

1093. Jean Baptiste Verdun and Jean Baptiste Mertens, of Paris, for certain improvements in the construction of celestial and terrestrial globes.

1094. John Scott Russell, of Great George-street, for improvements in marine steam-engines.

1095. Charles Goodyear, of Avenue-road, St. John's Wood, for improvements in combining India-rubber with certain metals.

1096. Thomas Taylor, of the Patent Saw Mills, Manchester, for improvements in apparatus for measuring and for governing the flow of water and other liquids.

1097. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in apparatus for rolling iron,—being a communication.

1098. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in the treatment of fibrous and other substances for the purpose of ascertaining the quantity of moisture contained therein,—being a communication.

1099. James Walker, of Bow, for improvements in turn-tables used for railway and other purposes.

The above bear date May 4th.

1100. William Moore, of Duke-street, Lambeth, for improvements in furnaces.

1101. Joseph Dempsey Holdforth, of Leeds, for improvements in machinery for combing or dressing silk and other fibrous substances.

1103. John Rawe, jun., of Lemaile, near Wadebridge, Cornwall, for propelling vessels and other vehicles in the water.

1104. Joel Livsey, of Bury, for an improvement in looms for weaving.

1105. Jean Conrad Stiffel, of the Poultry, for improvements in machinery for crushing auriferous quartz and amalgamating the gold therefrom,—being a communication.

1106. Matthias Edward Boura, of Crayford, for improvements in saddlery and harness.
1107. John Whiteley, of Stapleford, Nottingham, for improvements in warp-machinery for producing ornamented and textile fabrics.
1108. John Hetherington, of Manchester, for improvements in preparing cotton, wool, flax, silk, and other fibrous substances for spinning.
1109. Thomas Symes Prideaux, of St. John's Wood, for improvements in propelling vessels.
1110. Thomas Fearnley, of Bradford, Yorkshire, for improvements in steam-boilers.

The above bear date May 5th.

1112. Charles William Bell, of Manchester, for improvements in carriage-springs.
1114. George Dowler, of Birmingham, for improvements in boxes for containing and igniting matches.
1115. Augustus Brackenbury, of Camden-town, for improvements in precipitating the muriate of soda from its solutions in water.
1116. John Ryan Danks and Bernard Peard Walker, both of Wolverhampton, for improvements in machinery or apparatus for the manufacture of nails.
1117. James Egleson Anderson Gwynne, of Essex Wharf, Strand, for improvements in the treatment or manufacture of peat and other substances to be used as fuel.
1118. John Thomas Stroud, of Birmingham, for improvements in the valves of pressure lamps, and in lamp-burners.
1119. George William Jacob, of Dalston, for an improved manufacture of metallic covers or seals for bottles, jars, and other like vessels, and in applying or affixing them.
1120. Peter Armand Le Comte de Fontainemoreau, of South-street, for certain improvements in the manufacture of hat-plush,—being a communication.
1123. Mariano Riera, of Madrid, for certain improvements in fire-arms.
1124. Francesco Capeccioni, of Castle-street, for certain improvements in the manfacture of candles.

The above bear date May 6th.

1125. James Nichol, of Edinburgh, for improvements in book-binding.
1126. Christopher Richard Norris Palmer, of Amwell, for a new and improved mode of communicating or signalling between the guards and engine-drivers on a railway train; also applicable to other purposes.
1127. John Pullman, of Greek-street, Soho, for improvements in the manufacture of losh, or oil-dressed leather.
1128. Henry Warner, Joseph Haywood, and William Cross, of

Loughborough, for improvements in machinery used in the manufacture of frame-work knitting.

1129. Hesketh Hughes and William Thomas Denham, both of Cottage-place, City-road, for improvements in machinery for weaving.

1130. William Boggett, of St. Martin's-lane, and George Brooks Pettit, of Lisle-street, for improvements in apparatus for heating by gas.

1132. Alexander Chaplin, of Glasgow, for improvements in the construction of ships and boats.

1133. George England, of Hatcham Iron Works, New Cross, for improvements in screw-jacks.

The above bear date May 7th.

1135. John Fisher, of Liverpool, for improvements in machinery for propelling vessels, and in the mode of manufacturing the same.

1136. David Law, of Glasgow, and John Inglis, of the same place, for improvements in moulding or shaping metals.

1137. John Henry Johnson, of Lincoln's-inn-fields, for improvements in machinery for combing and preparing wool, and other fibrous materials,—being a communication.

1138. John Henry Johnson, of Lincoln's-inn-fields, for improvements in coating or plating vessels and other articles, for the better resistance of the action of acids and salts,—being a communication.

1139. Peter Wright, of Dudley, for improvements in the construction or manufacture of tew-irons.

1140. Thomas Quaife, of Battle, for improvements in the manufacture of watches, watch-cases, and in tools and apparatus employed therein.

The above bear date May 9th.

1142. James Brown, of Bridge-terrace, Canal-road, Stepney, for an improvement in anchors.

1143. John Clapham, Thomas Clapham, and William Clapham, of Wellington Foundry, Keighley, for improvements in moulding and casting iron pipes.

1144. Thomas Murray, of Marygold, Berwick, for certain improvements in breaks or drags for wheeled carriages, and in adapting the carriages for the application and use of such breaks.

1145. Gregory Kane, of Dublin, for the construction of portable houses, or portions thereof, out of parts, which may be used for other purposes.

1146. Octavius Henry Smith, of Bedford-square, and Youngs Parfrey, of Pimlico, for improvements in the manufacture of carriage wheels.

1147. Robert Brown, of Waterloo-road, Liverpool, for improvements in lifting and forcing water and other fluids.

1148. George Tillett, of Kentish Town, for improvements in the manufacture of metal bedsteads.

1149. George Roberton and Alexander Roberton, both of Bradford, Yorkshire, for improvements in apparatus for drying and finishing woven fabrics.

1150. William Johnson, of Lincoln's-inn-fields, for improvements in machinery or apparatus for sewing,—being a communication.

1152. Alexander Chaplin, of Glasgow, for improvements in apparatus for the transmission of aeriform bodies.

1153. George Stevenson Buchanan, of Glasgow, for improvements in the treatment or finishing of textile fabrics.

The above bear date May 10*th.*

1154. Samuel Russell, of Sheffield, for improvements in handles for razors.

1156. Marie Pierre Ferdinand Mazier, of Aigle, France, for a machine for cutting and reaping corn, corn crops, and other plants.

1158. John Crabtree, and Thomas Livesey Scott, both of Heywood, for certain improvements in machinery for preparing and spinning cotton and other fibrous substances.

1160. Richard Edmondson, of Blackburn, for certain improvements in the manufacture of covered corded textile fabrics, and in machinery to be used for that purpose,—being applicable either to hand or power.

1162. Thomas Powditch Jordeson, of Lewisham-road, New Cross, for certain improvements in rafting timber and other goods.

1164. William Bradbury and Frederick Mullett Evans, of Whitefriars, for improvements in taking impressions and producing printing surfaces,—being a communication.

1166. Julien François Belleville, of Paris, for improvements in propelling.

1168. John Lee Stevens, of King William-street, London, for an improved fastener for flowers and shrubs.

The above bear date May 11*th.*

1172. George Frederic Goble, of Fish-street-hill, for improvements in propelling vessels and carriages; parts of the machinery therein employed being also applicable to other like purposes.

1174. Martin Walter O'Byrne and John Dowling, of Raquet-court, Fleet-street, for improvements in the manufacture of mangles.

1176. Joseph Sawtell, of Newport, Monmouthshire, for improvements in economizing fuel, by rendering available the heat from coke ovens, and applying the same to the heating of air-kilns, stoves, ovens, and to the generation of steam.

The above bear date May 12*th.*

List of Patents

Granted for SCOTLAND, from the 22nd April to the 22nd May, 1853.

Lazare François Vaudelin, of Upper Charlotte-street, Fitzroy-square, London, for improvements in obtaining wool, silk, and cotton from old fabrics in a condition to be again used,—being a communication.—Sealed 2nd May.

Walter Westrup, of Wapping, London, for improvements in cleaning and grinding corn or grain, and dressing meal or flour.—Sealed 2nd May.

Christopher Nickels, of the York-road, Lambeth, and Benjamin Burrows, of Leicester, for improvements in weaving.—Sealed 4th May.

William Brown, late of Heaton, but now of Horton, Yorkshire, machinist, for certain improvements in machinery or apparatus for preparing and spinning wool, hair, flax, silk, and all other fibrous materials.—Sealed 6th May.

Richard Prosser, of Birmingham, civil engineer, for certain improvements in manufacturing buttons from certain materials; which improvements in manufacturing are applicable, in whole or in part, to the production of knobs, rings, and other articles from the same materials.—Sealed 13th May.

New Patents.

Sealed under Patent Law Amendment Act, 1852.

552. George Hattersley, of Sheffield, for a radiating hearth plate.—October 28.

577. John Crowther, of Huddersfield, and William Teale, of Wakefield, for improvements in obtaining motive power.—October 30.

578. Edmund Adolphus Kirby, of Haverstock Hill, for an improved adjusting-couch for medical, surgical, and general purposes.—October 30.

590. William Petrie, of Woolwich, for improvements in the manufacture of sulphuric acid.—November 1.

598. Henry Brock Billows, of the Curtain-road, for improvements in the construction of gas-burners for illuminating and heating purposes.—November 1.

608. Jerome André Drieu, of Manchester, for improvements in machinery for weaving and for dividing double cloth to make pile fabrics.—November 2.

609. John Nicholas Marion, of Paris, for a new mode of rendering concrete coleseed oil.—November 2.

628. Alfred Sidebottom, of Downham-road, Islington, for improvements in machinery or apparatus for cutting books, paper, and other substances.—November 3.
637. William Pope, of Holford-square, Pentonville, for improvements in the ventilation of ships.—November 4.
639. Joseph Reynaud, of Paris, for certain improved means of imitating marbles and various colored woods.—November 4.
641. Collinson Hall, of Essex, for an apparatus to be used in the carriage of solid and liquid bodies.—November 5.
651. Hesketh Hughes and William Thomas Denham, both of Cottage-place, City-road, for certain machinery for the manufacture of fancy ribbons, ornamental trimmings, chenilles, fringes, and gimps.—November 5.
652. James Hadden Young, of Camden Town, for improvements in weaving.—November 5.
658. John Ryall Corry, and James Barrett Corry, of Queen Camel, Somersetshire, for a new method of sewing gloves.—November 5.
668. Charles Frederick Day, of Ashford, and John Laylee, of Rye, for certain improvements in sleepers and other parts of the permanent ways of railroads.—November 6.
670. Charles Troupeau, of Paris, for an improved diurnal reflector.—November 8.
688. George Shadforth Ogilvie, of Stapleton, near Bristol, for improvements in candlesticks and lamps.—November 9.
693. William Tudor Mabley, of Manchester, patent agent, for improvements in ornamenting glass, and other transparent or partially transparent substances, for windows and for other purposes.—November 9.
696. John Down Gordon, of Eldon-street, Finsbury, for improvements in tuning piano-fortes.—November 9.
703. Auguste Baboneau, of Paris, for an improved apparatus for melting and mixing asphalte with bitumen and other substances.—November 10.
709. George Lucas, of Kennedy-street, Manchester, for a composition for filling engraved cast or sunk letters, devices, or ornaments on or in brass, zinc, or other metallic plates.—November 11.
717. William Davis, of Leeds, for improvements in machinery for cutting files.—November 11.
718. William Edward Middleton, of Birmingham, for a new or improved circular saw-bench.—November 12.
723. Daniel Henwood, of Charlton-street, Somers Town, for improvements in machinery for registering the number of passengers or persons entering public vehicles or vessels, theatres, bridges, or other places where it may be desirable to ascertain the number of persons entering therein.—November 12.
724. Charles Seaton, of Fitzroy-street, Fitzroy-square, for improvements in the manufacture of metal tubes, and in the machinery employed therein.—November 12.

725. Julien François Belleville, of Paris, for improvements in generating steam for producing motive power or heat—Nov. 12.
727. John Henry Johnson, of Lincoln's-inn-fields, for improvements in measuring and registering the flow of fluids,—being a communication.—November 12.
732. Robert John Smith, of Islington, for certain improvements in machinery or apparatus for steering ships and other vessels.—November 13.
735. Robert Lucas, of Furnival's-inn, for improved machinery to be used in the preparation of cotton and other fibrous materials for spinning,—being a communication.—November 13.
744. Gray Denison Edmeston, of Salford, and Thomas Edmeston, of Crow Oaks, Pilkington, for certain improvements in steam-engines; which improvements are also applicable to the regulating of water-wheels or similar machinery.—November 15.
748. Constant Jouffroy Duméry, of Paris, for certain improvements in the manufacture of metallic pipes and tubes, and in the machinery employed therein.—November 15.
750. John Mirand, of Castle-street, Holborn, for certain improvements in the construction of electric apparatus for transmitting intelligence.—November 15.
754. William Fraser Rae, of Edinburgh, for improvements in gas-heating and cooking apparatus.—November 15.
765. Joseph Johnson, of Wellington-quay, Dublin, for an improved mode of producing ornamental articles, such as brooches, bracelets, dressing and other cases, work and other boxes, or other light articles, from a certain kind of wood.—Nov. 16.
769. François Vallée, of Brussels, for improvements in preparing, spinning, and doubling flax, cotton, wool, silk, and other fibrous materials.—November 16.
773. Henry Russell, of Norwich, for improvements in pianofortes.—November 17.
781. James Hume, of Birkenhead, for improvements in water-closets.—November 19.
795. Henry Bessemer, of Baxter-house, Old St. Pancras-road, for improvements in apparatus for concentrating cane juices and other saccharine solutions, and in the treatment of such fluids.—November 19.
796. Henry Bessemer, of Baxter-house, Old St. Pancras-road, for improvements in the crystallization and manufacture of sugar.—November 19.
797. Henry Bessemer, of Baxter-house, Old St. Páncras-road, for improvements in the treatment of washed or cleansed sugar.—November 19.
799. Henry Bessemer, of Baxter-house, Old St. Pancras-road, for improvements in apparatus for concentrating saccharine fluids.—November 19.
801. John Trestrail, of Southampton, for improvements in raising sunken vessels or other materials from under the water or in the sea, or to prevent them from sinking.—November 20.

803. James Nasmyth, of Patricroft, near Manchester, for certain improvements in machinery or apparatus for packing and compressing cotton, wool, and other substances.—November 20.

809. William Green, of Islington, for improvements in the manufacture of textile fabrics, and in machinery or apparatus for effecting the same; parts of which improvements are also applicable to printing and embossing generally.—November 20.

813. John Weems, of Johnstone, for improvements in obtaining motive power.—November 22.

814. Robert Heggie, of Kircaldy, for improvements in railway breaks. November 22.

823. Auguste Edouard Loradoux Bellford, of Castle-street, for improvements in drying furnaces,—being a communication.—November 23.

830. James Armitage, of Bury, Huntingdon, and Charles Thaxter of Fenton, in the same county, for improvements in dies for moulding plastic materials—November 23.

831. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in the construction of, and method of applying brakes to railroad carriages, engines, and tenders, for the purpose of preventing collisions,—being a communication.—November 23.

836. William Oldham, of Southam, for an improved dibble drill.—November 24.

837. Augustus Turk Forder, of Leamington Priors, for improvements in fenders for railway carriages.—November 24.

838. James Carter, of Trump-street, London, for improvements in the manufacture of certain articles of dress or apparel.—November 24.

840. John Gedge, of Wellington-street, for an improved self-regulating artificial incubator,—being a communication.—November 24.

841. Peter Armand le Comte de Fontainemoreau, of South-street, for improvements in machinery for manufacturing fishing and other nets,—being a communication.—November 24.

846. Joseph Henri Combres, of Paris, for preventing the ill effects of dampness in walls and dwellings,—being a communication.—November 24.

847. Henry Thompson, of Clitheroe, for improvements in apparatus to be used in dyeing, bleaching, and other processes in which goods are operated upon in the piece.—November 24.

848. Charles Finlayson, of Manchester, for improvements in apparatus for heating, drying, and ventilating.—November 24.

853. Stephen Spalding, of Hogsthorp, Lincolnshire, for an apparatus or machine for the manufacture of pantiles used in building purposes.—November 24.

855. Robert Mortimer Glover, of Newcastle-upon-Tyne, M.D., for improvements in coating the bottoms and other parts of ships

and vessels, in order to prevent animal and vegetable growth in contact therewith.—November 24.

858. John Tatham, and David Cheetham, of Rochdale, for improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous substances.—Nov. 25.

860. William Hall, of Nottingham, for improvements in rotary steam-engines, governors, and apparatus for supplying boilers with water, and for regulating the same.—November 25.

869. Adam Ogden, of Huddersfield, and John Ogden, of Ashton-under-Lyne, for improvements in machinery for spinning cotton or wool.—November 26.

870. James Ward Hoby and John Kinniburgh, both of Renfrew, for improvements in the manufacture of metal castings.—November 26.

878. Thomas Charles Medwin, of Blackfriars-road, for improvements in water-gauges, or instruments for indicating the height of water in boilers.—November 26.

887. Thomas Wood, of the Glue Works, Hunslet, for improvements in the mode of obtaining motive power.—November 26.

890. Mathurin Jean Prudent Moriçeau, of Paris, for improvements in sharpening and dressing the cards of carding machines, and the clippers and cylinders of shearing machines.—November 26.

917. John Brannis Birch and Eugenius Birch, both of Cannon-row, for improvements in forming drains, and introducing pipes or tubes into the earth.—November 30.

924. William Slater, of Carlisle, for improvements in ovens and apparatus for baking.—December 1.

942. Peter Walker, and Andrew Barclay Walker, of Warrington, for improvements in fermenting ale and porter and other liquids.—December 3.

953. Richard Archibald Brooman, of Fleet-street, for improvements in the manufacture of sugar,—being a communication.—December 3.

961. Joseph Cliff, of Wortley, Leeds, for improvements in the mode of making and compressing bricks, lumps, tiles, quarries, terra-cotta, and other similar articles.—December 4.

974. Edward Tucker, of Belfast, for improvements in the manufacture or production of starch.—December 6.

984. Thomas Challinor, of Bolt-court, Fleet-street, for improvements in apparatus to be applied to decanters and other bottles to facilitate the running off liquids therefrom.—December 7.

988. Samuel Aspinwall Goddard, of Birmingham, for improvements in the construction of pistols.—December 7.

993. Peter Armand le Comte de Fontainmoreau, of South-street, for improvements in the machinery for applying metallic capsules,—being a communication.—December 8.

1072. Peter Armand le Comte de Fontainemoreau, of South-street, for an improved lamp, which he calls "lamp omnibus,"—being a communication.—December 16.

1075. Charles Barlow, of Chancery-lane, for improvements in bleaching, purifying, and concentrating sulphuric acid; parts of which invention are applicable to evaporating other liquids. —December 16.

1095. John Filmore Kingston, of Carrol County, Maryland, for improvements in obtaining reciprocating motion and in propelling and steering vessels.—December 17.

1103. Edward Schischkar, of Halifax, for improvements in dyeing and coloring yarns and textile fabrics.—December 18.

1104. Edward Schischkar, of Halifax, for improvements in coloring or staining yarns and textile fabrics.—December 18.

1105. Charles Constant Boutigny, of Evreux, France, for improvements in distillation, and in the apparatus employed therein.—December 18.

1106. John Clay, of Cottingham, Yorkshire, Esq., for improvements in the manufacture of coal-gas.—December 18.

1111. William Wilkinson, of Nottingham, for improvements in the manufacture of paper and pasteboard, and in the production of a substance applicable for veneers, panels, and to many purposes to which gutta-percha and papier-mâché are applicable.—December 20.

1113. Charles Pilkington, Thomas Pilkington, and Abraham Pedigor, of Sheffield, for an improved joiner's brace.—Dec. 20.

1194. James Edgar Cook, of Greenock, for an improved composition for the prevention of the decay and fouling of ships' bottoms and other exposed surfaces.—December 29.

1196. James Power, of Paris, for silvering all sorts of metals, and of glass.—December 29.

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5. Joseph John William Watson, of Old Kent-road, and William Prosser, of Adam-street, Adelphi, for an improved method of manufacturing steel and of carburizing iron.—January 1.

6. Thomas Billyeald, of Lenton, for an improvement in the apparatus and arrangement of apparatus for making looped fabrics.—January 1.

11. John Bleackley, jun., of Prestwich, for improvements in machinery to be used in washing, bleaching, dyeing, and sizing yarns and fabrics.—January 3.

14. Charles Edwards Amos, of the Grove, Southwark, for certain improvements in the construction of centrifugal pumps.—January 3.

22. Gustave Eugène Michel Gerard, of Paris, for improvements in manufacturing and treating caoutchouc.—January 5.

31. William Louis Sheringham, of Southsea, Capt., R.N., for illuminating buoys and beacons in harbours, roadsteads, and rivers.—January 6.

32. Edward Hutchinson, of Tyldesley, Lancashire, for certain improvements in the mode or method of preparing, cleaning, drying, and otherwise treating wheat, pulse seeds, and other grain.—January 6.

35. Edme Augustin Chameroy, of Paris, for a new composition of different metals or metallic substances.—January 6.
38. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in roving, spinning, or twisting cotton or other fibrous substances; which invention he denominates "Larwill's improvements,"—being a communication.—Jan 6.
39. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements in the construction of bearings or steps for shafts, turntables, or moveable platforms; which invention he denominates "Parry's improvements,"—being a communication.—January 6.
40. William Beales, of Louth, for an improved cement for the resistance of fire.—January 6.
41. Peter Graham, of Oxford-street, for improvements in the manufacture of carpets and other piled fabrics,—being a communication.—January 6.
50. Richard Gittings, of Thayer-street, Manchester-square, for improvements in tills.—January 7.
51. Hezekiah Marshall, of Canterbury, for certain improvements in the transmission and emission of air and sound.—January 7.
64. Michael Fitch, of Chelmsford, for improvements in ovens.—January 10.
66. John Davies Morries Stirling, of Camphill, near Birmingham, for improvements in the manufacture of percussion caps.—January 10.
72. James Thornton, of Derby, John Thornton, of Melbourne, and Albert Thornton, of the same place, for improved nets and other textile fabrics, to be used for gloves and other purposes, and for the machinery to be employed in the manufacture thereof.—January 11.
73. Joseph Robert Wilkin Atkinson, of Leeds, for improvements in machinery for preparing and spinning flax, tow, and other fibrous substances.—January 11.
74. Thomas Cottrill, of West Bromwich, for improvements in the manufacture of certain salts of soda.—January 11.
77. John McDowall, of Johnstone, North Britain, for improvements in cutting or reducing wood and other substances.—January 12.
79. John Hick, of Bolton-le-Moors, for certain improvements in the method of lubricating revolving shafts and their bearings or pedestals.—January 12.
85. William Nairne, of Perth, for improvements in reeling yarns or threads.—January 12.
86. Edward Haslewood, of Tufnel Park, Holloway, for improvements in fire-arms and projectiles,—being a communication.—January 12.
89. John Bennett, and Henry Charlesworth, of Huddersfield, for improvements in doffing and preparing rovings of wool.—January 12.

92. William Brown, of Glasgow, for an improved method of treating coal and bituminous substances, and for improvements in the treatment of their volatile products.—January 13.
94. Edward Wills Uren, of Walkhampton, for the manufacture of bricks, pipes, tiles, imitation stone, and peat bricks for fuel, by the means of a machine and arrangements of machinery, titled "a central circular and horizontal motion."—January 13.
101. William Steads, of Redcross-street, Leicester, for improvements in blinds, maps, charts, and other articles wound on rollers.—January 14.
103. James Stewart Kincaid, of Dublin, for improvements in ascertaining and registering the number of persons entering or quitting omnibuses or other vehicles or vessels; which improvements are applicable, in whole or in part, to buildings or other places.—January 15.
108. Peter Alexander Halkett, of Richmond-hill, for an improved construction of inkstand.—January 15.
111. Thomas Cropper Ryley, of Haigh Foundry, near Wigan, and Edward Evans, of the same place, for certain improvements in the construction of wrought-iron wheels, to be used upon railways or for other purposes, and in the machinery or apparatus connected therewith.—January 17.
117. Henry Henson Henson and William Frederick Henson, both of Hampstead, for improvements in signalizing on railways, and in the apparatus used therein.—January 17.
121. Henry Browning, of Bristol, for improvements in preparing compositions for coating iron and other ships' bottoms, and other surfaces.—January 18.
123. Orlando Reeves, of Taunton, for improvements in the manufacture of manure.—January 18.
125. Peter Fairbairn and Samuel Renny Mathers, both of Leeds, for certain improvements in machinery for drawing the sliver and rove flax, hemp, and tow.—January 18.
129. William Vincent, of Brick-lane, Spitalfields, for improvements in cocks or taps.—January 19.
130. Sydney Smirke, of Berkeley-square, for improvements in apparatus for giving signals on railways.—January 19.
131. Joseph Rock Cooper, of Birmingham, for improvements in fire-arms.—January 19.
137. John Crabtree, of Heywood, for improvements in machinery for winding and doubling yarns.—January 20.
144. William Riddle, of East Temple-chambers, for improvements in ornamenting walls, ceilings, and other surfaces.—Jan. 20.
146. Augustus Thomas John Bullock, Lieut. R.N., for improvements in taps and cocks.—January 20.
152. George Thornton, of Gargrave, Yorkshire, for certain improvements in propelling vessels.—January 21.
153. James Middlemass, of Edinburgh, for the application of a new material to the construction of portable houses and other buildings.—January 21.

154. William Edward Newton, of the Office for Patents, Chancery-lane, for improvements applicable to clocks and other time-keepers, for the purpose of indicating not only the time of the day, but the day of the week, the month, and the year; which invention he intends to denominate "Hawes' calendar clock, or time-piece,"—being a communication.—January 21.
156. Matthew Andrew, of Hyde, for certain improvements in fastenings for windows.—January 21.
158. William Joseph Curtis, of Birchin-lane, for an invention for excavating or digging earth, and for carrying or delivering the soil.—January 21.
160. John Chubb, of St. Paul's Church-yard, and John Goater, for improvements in locks and latches.—January 21.
174. David Clovis Knab, of Paris, for improvements in the process of, and apparatus for, distilling certain vegetable and mineral matters, and also animal bones and flesh.—January 24.
177. Charles Randolph and John Elder, both of Glasgow, for improvements in propelling vessels.—January 24.
182. Warren Fisk Shattuck, of the Strand, for a smut machine,—being a communication,—January 25.
187. Frederick Simpson, of Red Hill, for improvements in combining materials for cleansing or whiteing stone.—Jannary 25.
188. John Sangster, of Cheapside, for improvements in umbrellas and parasols,—being a communication.—January 25.
189. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improvements in the manufacture of printing surfaces,—being a communication.—January 25.
191. Robert William Sievier, of Upper Holloway, and Robert William Waithman, of High Bentham, Yorkshire, for improvements in bleaching animal and vegetable fibrous materials.—January 25.
193. John Edward Mayall, of Regent-street, for improvements in the production of crayon effects by the Daguerreotype and photographic processes.—January 25.
195. Isaac Davis, of High Holborn, for improvements in optical and mathematical instruments.—January 26.
200. John Henry Johnson, of Lincoln's-inn-fields, for improvements in the method of lubricating machinery, and in the mechanism or apparatus employed therein,—being a communication.—January 26.
201. James Combe, of Belfast, for improvements in machinery for heckling or combing flax and other fibrous substances.—January 26.
212. William Tranter, of Birmingham, gun-maker, for certain improvements in fire-arms.—January 28.
216. George Edmond Donisthorpe, and John Crofts, of Leeds, for improvements in combing wool, hair, or other fibrous materials.—January 28.
217. James Pole Kingston, of Lewisham-road, Kent, for improve-

ments in combining metals for the bearings and packings of machinery.—January 28.

219. John Scott Russell, of Great George-street, for improvements in constructing ships and vessels propelled by screw or such like propeller.—January 28.

223. Harold Potter, of Darwen, for improvements in the mode or method of producing a certain color or colors on woven or textile fabrics and yarns, and in the machinery or apparatus connected therein.—January 29.

226. Henry Moorhouse, of Denton, for improvements in the mode or method of preparing cotton, wool, flax, or other fibrous materials, and in the machinery or apparatus employed therein. —January 29.

231. Richard Archibald Brooman, of Fleet-street, for improvements in diving-bells, and apparatus to be used in connection therewith,—being a communication.—January 29.

234. William Watson Hewitson, of Spring Field Mount, Leeds, for improvements in suspending or applying mariners' compasses in vessels built of iron or partly of iron.—January 29.

240. William Edward Newton, of the Office for Patents, Chancery-lane, civil engineer, for improvements in machinery for dressing cloth,—being a communication.—January 29.

242. George Twigg and Arthur Lucas Silvester, of Birmingham, for improvements in apparatus for cutting and affixing stamps and labels,—partly a communication.—January 29.

250. Walter Williams, jun., of West Bromwich, for improvements in machinery for cutting or shearing iron and other metals.—January 31.

254. Thomas Lightfoot, of Accrington, for improvements in glazes for pottery or other similar materials.—January 31.

257. Israel P. Magoon, of Vermont, America, for a new and useful improvement in steam-boiler chimneys.—January 31.

272. Joshua Murgatroyd, of Heaton Norris, for improvements in the construction of boilers and apparatus connected therewith. —February 1.

273. John Cockerill, of Kingston-upon-Hull, and Thomas Barnett, of the same town, for improvements in the construction and use of coffee roasters.—February 1.

275. James Carter, of Oldham, for an improved rotary engine.—February 1.

276. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, for improvements in block printing machinery,—being a communication.—February 1.

299. Alfred Tylor, of Warwick-lane, Newgate-street, and Henry George Frasi, of Herbert-street, New North-road, for improvements in water-closets.—February 3.

304. Frederick John Jones, of Addle-street, for improvements in fastenings for bands, belts, straps, and other similar articles,—being a communication.—February 4.

CELESTIAL PHENOMENA FOR JUNE, 1853.

D.	H.	M.	
1			Clock after the ☉ 2m. 31s.
—			☽ rises 2h. 8m. M.
—			☽ passes mer. 8h. 8m. M.
—			☽ sets 2h. 21m. A.
3	5	56	♅ in conj. with the ☽ diff. of dec. 3. 9. N.
	17	31	♂ in conj. with the ☽ diff. of dec. 2. 40. N
4	0	39	♃'s first sat. will im.
4	11	52	♄ in conj. with the ☽ diff. of dec. 0. 19. N.
	18		☽ in Apogee
5			Clock after the ☉ 3m. 29s.
—			☽ rises 4h. 0m. M.
—			☽ pass mer. 10h. 8m. M.
—			☽ sets 4h. 30m. A.
	11	19	☿ in conj. with the ☽ diff. of dec. 0. 56. N.
6			☉ eclipsed, invis. at Greenwich
6	8	3	Ecliptic conj. or ● new moon
	9	18	♃'s second sat. will im.
	22	34	♀ in conj. with the ☽
7	8	52	☿ in the ascending node.
10			Clock after the ☉ 0m. 56s.
—			☽ rises 6h. 34m. M.
—			☽ pass mer. 3h. 4m. A.
—			☽ sets 11h. 22m. A.
	3	33	♃ oppo. to the ☉
	—		Occul. γ Cancri, im. 10h. 55m. em. 11h. 19m.
11			Pallas stationary
	17	9	Vesta in conj. with ♀ diff. of dec. 1. 36. S.
	22	6	☿ in Perihelion
12	11	13	♃'s first sat. will em.
13	2	17	☿ in super. conj. with the ☉
14			Mercury, R. A., 5h. 35m. dec. 24. 25. N.
	—		Venus, R.A., 6h. 2m. dec. 24.7. N.
	—		Mars, R. A., 3h. 24m. dec. 18. 19. N.
	—		Vesta, R. A., 5h. 59m. dec. 22. 30. N.
	—		Juno, R. A., 6h. 21m. dec. 14. 57. N.
	—		Pallas, R. A., 14h. dec. 24. 6. N.
	—		Ceres, R. A., 14h. 7m. dec. 4. 30. S.
	—		Jupiter, R. A., 17h. 12m. dec. 22. 29. S.
14			Saturn, R. A., 3h. 34m. dec. 17. 13. N.
	—		Uranus, R. A., 2h. 34m. dec. 14. 44. N.
	—		Mercury pass mer. 0h. 4m.
	—		Venus pass mer. 0h. 37m.
	—		Mars pass mer. 21h. 52m.
	—		Jupiter pass mer. 11h. 39m.
	—		Saturn pass mer. 22h. 0m.
	—		Uranus pass mer. 21h. 0m.
14	2	29	♃'s second sat. will em.
	3	27	☽ in □ or first quarter
15			Clock before the ☉ 0m. 6s.
	—		☽ rises 0h. 44m. A.
	—		☽ pass mer. 7h. 6m. A.
	—		☽ sets 0h. 55m. M.
17	4	25	Vesta in conj. with ☿ diff. of dec. 2. 23. S.
18	1	44	♂ in conj. with ♄ diff. of dec. 1. 45. N.
	5	26	Juno in conj. with ♀ diff. of dec. 9. 10. S.
19			Ceres stationary
	16		☽ in Perigee
20			☽ eclipsed, invis. at Greenwich
	—		Clock before the ☉ 1m. 10s.
	—		☽ rises 7h. 52m. A.
	—		☽ pass mer. 11h. 45m. A.
	—		☽ sets 2h. 48m. M.
		5	♃ in conj. with the ☽ diff. of dec. 0. 24. N.
	1	7	♃'s first sat. will em.
	8	22	Juno in conj. with ☿ diff. of dec. 10. 2. S.
21	1	23	☉ enters Cancer, Summer com.
	6	11	Ecliptic oppo. or ○ full moon
22	3	23	☿ in conj. with ♀, diff. of dec. 0. 53. N.
	6	12	☿ greatest hel. lat. N.
25			Clock before the ☉ 2m. 14s.
	—		☽ rises 11h. 41m. A.
	—		☽ passes mer. 3h. 47m. M.
	—		☽ sets 8h. 25m. M.
26	21	41	Vesta in conj. with the ☉
28	6	36	☽ in □ or last quarter
	9	30	♃'s first sat. will em.
29	18	0	♀ in Perihelion
30	14	53	♅ in conj. with the ☽ diff. of dec. 3. 2. N.

J. LEWTHWAITE Rotherhithe.

n constructing railways, bridges, &c.

Fig. 5.

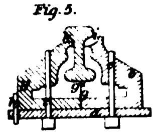


Fig. 6.

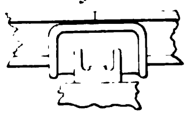


Fig. 11.

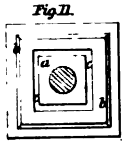


Fig. 7.

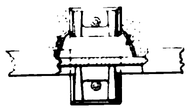


Fig. 8.

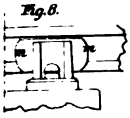
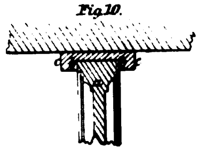


Fig. 10.



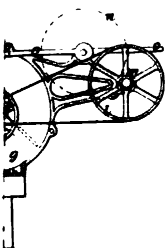
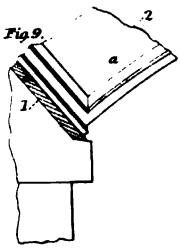
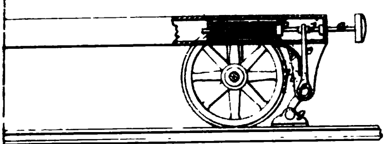


Fig. 9.

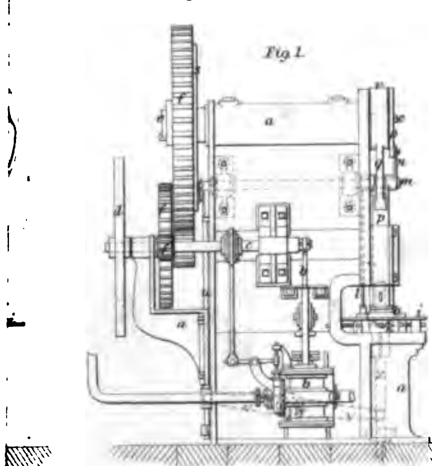


p^t in railway carriages.



n's mach^y for making bricks, tiles, &c.

Fig. 1.



T. Sherratt, Sc.

Holmes' mach.y for punching & stamping metal.

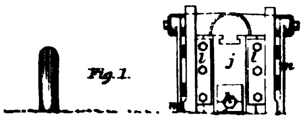


Fig. 1.

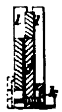


Fig. 2.

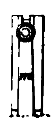
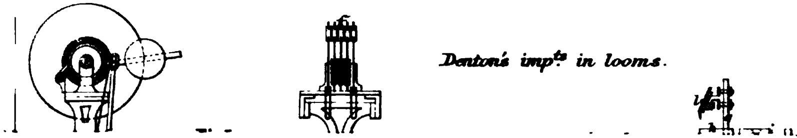
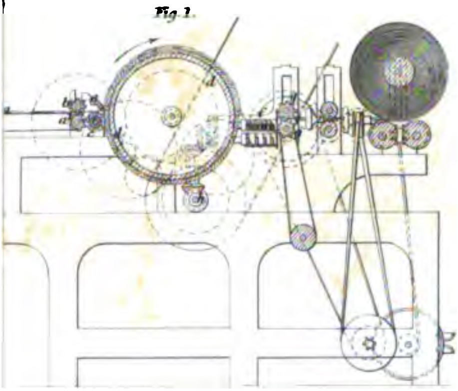


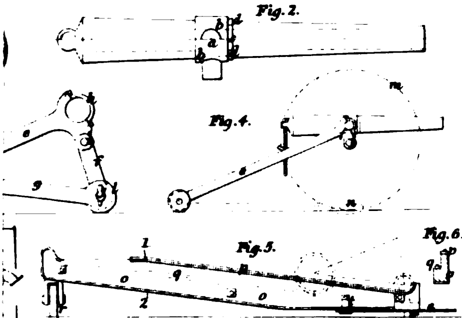
Fig. 3.



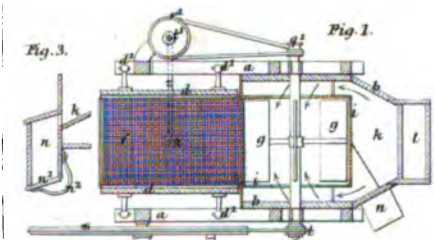
Denton's imp.ts in looms.

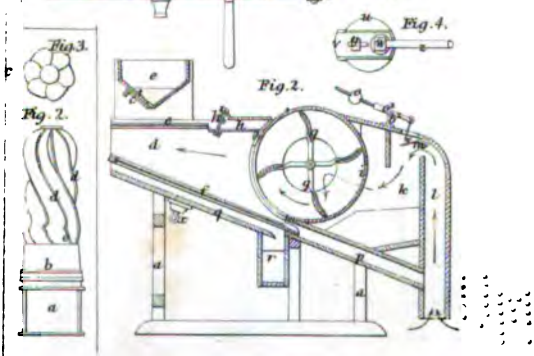


Simmons & Walker's imp^ts. in ordnance.



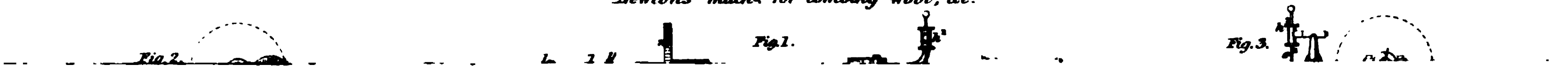
Newton's Winnowing machine.





T. Sherratt Sc.

Newton's mach^y for combing wool, &c.



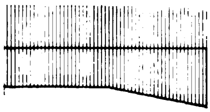
Underhay's imp^{ts} in water-closets, cocks, &c.

Newell's imp^{ts} in locks.

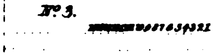
Impts in weaving.

No. 1.

No. 2.



No. 3.



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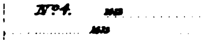

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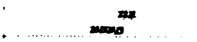


Broeman's sounding instrument.

Fig. 2.

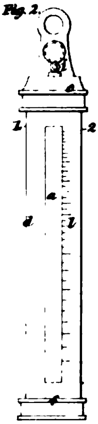


Fig. 1.

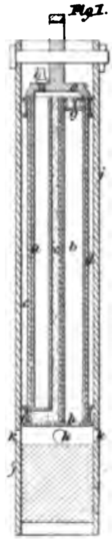


Fig. 3.

Illustrations of mach! Engineers Trans.

Fig. 1.

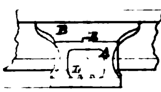


Fig. 4.

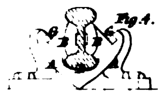


Fig. 3.

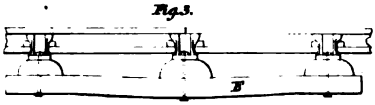


Fig. 5.

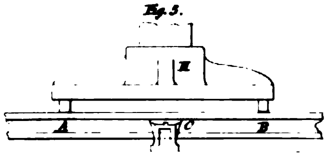


Fig. 6.

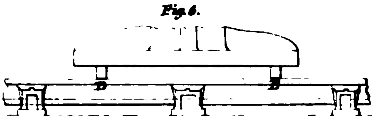


Fig. 7.

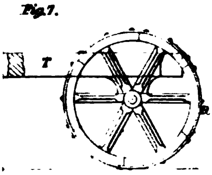
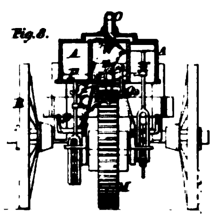
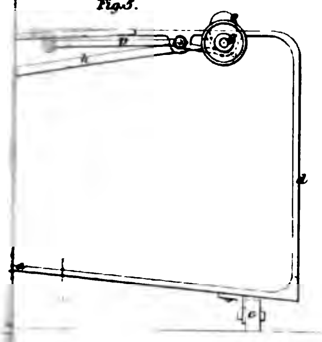


Fig. 8.



T. Sherratt Sc.

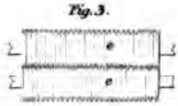
Fig. 5.



...achine.

Fig. 4.

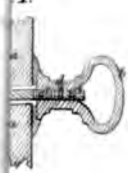
Fig. 3.



Gray's Cocks and Valves

...ock Spindle.

...1.



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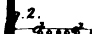

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